



Smart Motorways Programme

**M4 Junctions 3 to 12 Smart Motorway
Combined Safety and Hazard Log Report
(SGAR 6)**

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Sign-Off / Approval Sheet

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<p>Name: Paul Benham</p> <p>Date:</p> <p>Signature:</p>	<p>Operations Directorate Senior User (Area 3) Highways England</p>	<p>I accept that in relation to the project operating regime the scope and content of the attached deliverable are correct and fit for purpose given the current stage of the project.</p>
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Name: Steve Foxley Date: Signature	Programme Delivery Director	I approve that in relation to project safety & the PCF: <ul style="list-style-type: none">• the attached deliverable complies with the requirements for guidance for the safety governance of Highways England projects, in as far as is reasonably practicable• that all required signatures for this product have been obtained.

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Executive Summary

Introduction

The M4 J3-12 Smart Motorways (SM) scheme will be implemented on the M4 between Junction 3 (J3) and Junction 12 (J12). This document is the Combined Safety and Hazard Log Report for the implementation of the M4 J3-12 SM scheme at stage gate assessment review (SGAR) 6.

The purpose of the document is to demonstrate at SGAR 6 that the appropriate safety risk assessment has been undertaken (in accordance with General Guidance (GG) 104 [21]) to assess the expected safety performance for the M4 J3-12 SM scheme.

The key challenges for the M4 J3-12 SM scheme relate to:

- Development consent order (DCO) – the scheme is a nationally significant infrastructure project under the planning act 2008. Therefore, a DCO application had to be made to the planning inspectorate.
- The length of the scheme (32 miles) with a five-lane smart motorway between J4 and J4b eastbound and westbound and a key strategic motorway to motorway interchange with the M25 near Heathrow Airport.
- The implications of having no hard shoulder for on-road operation (traffic officers and core responders).
- The acceptance of the all lane running (ALR) design by emergency services and other key stakeholders.
- Agreement of incident access protocols with the emergency services, particularly regarding the length of the scheme and the lack of turnaround points.
- The impact on maintenance access and maintenance operations through the removal of the hard shoulder.
- Operation of a maximum 60mph speed limit between J4-3 eastbound.

Approach to Value Engineering

A series of value engineering workshops were held through May - September 2019 with key stakeholders, resulting in several design changes. This report has been updated to reflect the value engineering design changes; the key ones are listed below:

- Use of non-through junction running (non-TJR) at J6, J8/9 and J11 with associated design changes such as gantry redesign and descoping of works on affected structures.
- Removal of remotely operated temporary traffic management signs such that 'signalling for roadworks' is used instead.

Conclusions

The information presented in this report demonstrates that:

A safety objective has been set for the scheme and is likely to be achieved.

The generic assessment of ALR schemes assumes that motorway incident detection and automatic signalling (MIDAS) is not in place prior to installation of ALR. MIDAS is already installed on the M4 J3-12 section. In order to take account of this, the safety baseline is amended to:

- 110% of the number (averaged per annum) of fatal and weighted injury (FWI) casualties and the rate of FWIs per billion vehicle miles per annum averaged for the three years prior to scheme implementation
- The scheme will satisfy the safety objective if both key indicators below are demonstrated to be better than the safety baseline for the three years after full scheme opening:
 - Number of FWI casualties, and
 - Rate of FWI casualties per billion vehicle miles
- The M4 J3-12 SM scheme is expected to provide safety benefits and meet its road user safety objective due to the improved standards that will be achieved on this route from implementing the new ALR configurations, which compensate for the conversion of the hard shoulder into a running lane
- The risk to road workers must be managed in accordance with the requirements of the Health and Safety at Work etc, Act As Low As Is Reasonably Practicable (ALARP). There will be no specific numerical safety objective set for road workers
- Application of the M4 J3-12 SM scheme hazard log tool indicates that the road worker safety objective will be achieved for M4 J3-12 SM scheme through the installation of rigid concrete barrier and the use of signalling for roadworks

An appropriate categorisation of activity type has been selected for the project and has been applied

- The categorisation of activity process is documented in the scheme Safety Plan [1], which recommended a type B with one type C issue for the M4 J3-12 SM scheme. This is a result of a significant interest from key stakeholders (a type C indicator). The safety assessment has been undertaken in accordance with GG 104 [21]
- These issues suggest that the standard type B categorisation of activity should be supplemented with some additional activities e.g. regular engagement with stakeholders. This aligns with the ALR interim advice note (IAN) 161/13 [2] design requirement
- The project has been resourced with competent people to carry out the safety work
- A robust safety approvals process is in place for safety documents
- The Plan for Monitoring Operations [27] describing the monitoring and control requirements will be available before operation commences

- The Combined Safety and Hazard Log Report will be handed over to Highways England for operation and maintenance after project completion
- All safety risk assessments developed during this project are included as an annex document to this report. A summary table is included in Appendix H

Hazards are well managed

- A Safety Control Review Group (SCRG¹) meeting for the M4 J3-12 scheme was held on 26th March 2013 at which the outcomes of the preliminary road worker safety assessment were reviewed and accepted. A further SCRG meeting held on 14th May 2013 reviewed and accepted the significant hazards associated with the scheme as assessed at that stage of the project.
- Following publication of IAN161/13 [2] and the associated ALR Generic Safety Report [4], the scores for some hazards have been changed to reflect the updates in the generic IAN161/13 [2] hazard log.
 - The highest risk hazard scores for the M4 J8/9-12 section were reviewed at SCRG meetings on 12th September 2013 and 28th November 2013. The scores for M4 J3 – 12 SM scheme were reviewed and these were in line with the highest risk scores accepted for the M4 J8/9-12 section.
 - Following ongoing design development further SCRG reviews of the M4 J3-12 SM scheme were conducted at meetings on 11th December 2014 and 5th February 2015.
- Following publication of IAN 161/15 [3] and the results of three year monitoring of the first ALR schemes on the M25 J23-27 and M25 J5-7, some assumptions and hazard score calculations from the generic ALR hazard log were updated [15] [16]. The scheme specific M4 J3-12 SM scheme hazard log has been updated in line with updates and changes made to the generic ALR hazard log. Following this update the high scoring hazards were reviewed at a SCRG meeting on 15th December 2016.
- The high scoring hazard scores were initially reviewed for PCF Stage 6, with no required changes identified. The approach and outcome of the review was presented and accepted at the SCRG on 16th May 2019.
- The high scoring hazard scores have been reviewed again following the value engineering design changes with minor amendments made.

Appropriate methods and processes are being used in delivering the project

- Most of the components on the M4 J3-12 SM scheme are designed to the requirements of IAN161/13 for ALR schemes. However, certain locations will have a different provision mainly

¹ In accordance with previous guidance, SCRG was referred to as Project Safety Control Review Group (PSCRG) for meetings held up to April 2019. These terms are used interchangeably within the safety governance audit trail.

due to their location specific constraints (e.g. the existing metal VRS will be retained instead of concrete barrier in the central reserve on the Langley Junction underbridges at J5 because the existing bridge is unable to accommodate the concrete barrier).

- Good practice and project wide systems are being followed during project execution.

Summary

It can be concluded from the information summarised in this Combined Safety and Hazard Log Report that the objective to “demonstrate at SGAR 6 that the appropriate level of safety risk assessment has been undertaken to assess the expected safety performance for the implementation of smart motorway on the M4 J3-12 SM scheme” has been met.

1. Introduction

This introduction sets out the purpose, scope and structure of the Combined Safety and Hazard Log Report. For further background information on the M4 J3 to 12 Smart Motorway (SM) scheme, refer to Highways England's Client Scheme Requirements product [13], which details the following:

- Description and location
- Challenges, issues and constraints
- Objectives
- Programme timescales
- Contact details of project team

The key challenges for the M4 J3-12 SM scheme relate to:

- Development consent order (DCO) – the scheme is a nationally significant infrastructure project under the planning act 2008. Therefore, a DCO application had to be made to the planning inspectorate (PI). The PI consider the application before making a recommendation to the Secretary of State, who decides whether, and on what terms, a DCO should be granted for the proposed scheme. In September 2016, the Secretary of State decided under section 114 of the 2008 Act to make with modifications an Order granting development consent for the proposals in the application
- The length of the scheme (32 miles) with a five-lane smart motorway between J4 and J4b eastbound and westbound and a key strategic motorway to motorway interchange with the M25 near Heathrow Airport
- The implications of having no hard shoulder on on-road operation (traffic officers and core responders)
- The acceptance of the ALR design by emergency services and other key stakeholders
- Agreement of incident access protocols with the emergency services, particularly regarding the length of the scheme and the lack of turnaround points
- The impact on maintenance access and maintenance operations through the removal of the hard shoulder
- Operation of a maximum 60mph speed limit between J4-3 eastbound

1.1 Report purpose and scope

The purpose of the report is to demonstrate at stage gate assessment review (SGAR) 6 that the appropriate level of safety risk assessment (in accordance with General Guidance (GG) 104 [21], Requirements for safety risk assessment) has been undertaken to assess the expected safety performance for the implementation of a smart motorway operating regime between M4 J3-12.

This report is applicable to all the project lifecycle stages of the M4 J3-12 SM scheme including operations and decommissioning. The report has evolved as the scheme progressed, with more detail being added as additional information became available. This report was originally prepared based on the General Direction (GD) 04/12 'Standard for safety risk assessment on the strategic road network' [20] risk assessment principle and the All Lane Running (ALR) Generic Safety Report [4]. As part of the PCF Stage 6 update, the principles of GG 104 [21] have been applied.

This version of the Combined Safety and Hazard Log Report covers the construction, commissioning and handover stage (SGAR 6) for the application of a smart motorway operating regime. The report aims to provide a suitable level of confidence to the Safety Control Review Group (SCRG) and the M4 J3-12 SM Project Board at the construction, commissioning and handover stage, that the design can meet the required level of safety.

Future versions will be required for SGAR 6 as different sections open to traffic and the closeout stage (SGAR 7).

1.2 Approach to Value Engineering

Certain value engineering design changes have been made during (project control framework) PCF Stage 6 that have impacted this product. A series of value engineering workshops were held through May-September 2019 with key stakeholders. The following changes are reflected in this document:

- Use of non-Through Junction Running (non-TJR) at J6, J8/9 and J11 with associated design changes such as gantry redesign and descoping of works on affected structures
- Removal of remotely operated temporary traffic management signs (ROTTMS) such that 'signalling for roadworks' is used instead

1.3 Report structure

The structure of this document is summarised below:

Section	Description
1	Introduction
2	Has the safety objective been agreed and is it likely to be achieved? Sets out the safety baseline and safety objective for the project and the demonstration that the safety objective is likely to be achieved
3	Has a categorisation of activity type been followed? Describes how an appropriate safety risk categorisation has been selected and applied, and shows that the project has been resourced with competent people to undertake the safety work, a robust safety approvals process is in place, there are plans in place to monitor the safety

	performance of the scheme after opening, and that the Combined Safety and Hazard Log Report will be handed over to Highways England for operation and maintenance
4	Have hazards been well managed? Demonstrates that hazards have been significantly mitigated by designing to standards
5	Have appropriate methods and processes been followed during project execution? Shows that the design for the M4 J3-12 SM scheme is generally compatible with standards, guidelines and regulations, that good practice and project wide systems have been followed during project execution and that stakeholders have been engaged
6	Conclusions
Appendix A	References
Appendix B	Glossary of terms and abbreviations
Appendix C	Goal structuring notation (GSN)
Appendix D	SCRG key issues
Appendix E	Scheme safety requirements
Appendix F	Medium scoring hazards
Appendix G	Specific population hazards
Appendix H	Safety risk assessments completed on the M4 J3-12 SM scheme

2. Has the safety objective been agreed and is it likely to be achieved?

This section demonstrates that:

- The safety baseline for the project safety objectives has been agreed
- The safety objectives have been agreed for both road users and road workers
- The methodology for demonstrating the achievement of the safety objectives has been developed and agreed
- Achievement of the safety objectives can be demonstrated

2.1 Safety baseline for the M4 J3-12 SM scheme

The safety baseline to be used for the scheme is the number (averaged per annum) of fatality and weighted injuries (FWI) casualties and the rate of FWIs per billion vehicle miles per annum averaged for the three years, across both carriageways, prior to the installation of any element of smart motorway (i.e. it is a dual 3-lane motorway (D3M)).

The generic assessment of ALR schemes assumes that motorway incident detection and automatic signalling (MIDAS) is not in place prior to installation of ALR. MIDAS is already installed on the M4 J3-12 scheme. In order to take account of this, the safety baseline is amended to:

110% of the number (averaged per annum) of FWI casualties and the rate of FWIs per billion vehicle miles per annum averaged for the three years prior to scheme implementation².

FWI is defined as:

(number of fatalities) + 0.1 x (number of serious casualties) + 0.01 x (number of slight casualties)

The safety baseline calculations are provided in the M4 J3-12 SM scheme safety plan [1]. The baseline is taken from three years of STATS19 casualty data (January to December 2015-2017) and is summarised in Table 2-2 and

Table 2-3 below. The figures are compared against the strategic road network (SRN) motorway average, calculated from data provided in the three most recently published 'Reported Road Casualties on the SRN' reports (2014, 2015 and 2016) [31].

Table 2-1: Red, amber, green (RAG) status key

RAG	% above / below the SRN motorway average
Red	>25% higher
Amber	Between 0 and 25% higher
Green	Less than or equal to SRN motorway average

² 110% is used to accommodate the benefits of MIDAS which has been found to provide a circa 10% reduction in accidents.

Table 2-2: Personal injury collision (PIC) summary - current situation

PIC type	M4 J3-12 annual (average) no. PICs	M4 J3-12 annual PIC rate (per billion vehicle miles)	% above / below the SRN motorway average	Annual SRN motorway average PIC rate (per billion vehicle miles)
Fatal	2.33	1.52	17%	1.30
Serious	14.33	9.32	-3%	9.58
Killed and seriously injured (KSI)	16.67	10.84	0%	10.88
Slight	114	74.14	4%	71.42
Total	130.67	84.98	3%	82.31
KSI Severity Ratio - PIC		12.76%	-4%	13.22%

Table 2-3: Casualty summary - current situation

Casualty type	M4 J3-12 Annual (average) no. casualties	M4 J3-12 Annual casualty rate (per billion vehicle miles)	% above / below the SRN motorway average	Annual SRN motorway average casualty rate (per billion vehicle miles)
Fatal	2.67	1.73	21%	1.44
Serious	18.67	12.14	7%	11.36
KSI	21.33	13.87	8%	12.80
Slight	195.33	127.04	3%	123.19
Total	216.67	140.92	4%	135.98
Annual FWI rate per billion vehicle miles		4.22	11%	3.80
KSI Severity Ratio - PIC		9.85%	5%	9.41%

This data suggests that in general the section is performing slightly worse than the SRN motorway average, in terms of both PICs and casualties.

2.2 Safety objectives for the M4 J3-12 SM scheme

There are two safety objectives for the scheme as defined in the M4 J3-12 SM Safety Plan [1].

Road Users: The scheme will satisfy the safety objective if both two key indicators (i) the number (averaged per annum) of FWI casualties; and (ii) the rate of FWIs per billion vehicle miles per annum) are demonstrated to be better than the safety baseline for the three years after full scheme opening. Safety risks for individual populations³ shall be assessed and managed in accordance with the requirements for safety risk assessment (refer to GG 104 [21]).

Road Workers: The risk to road workers must be managed in accordance with the requirements of the Health and Safety at Work etc Act As Low As Reasonably Practicable (ALARP). There will be no specific numerical safety objective set for road workers. The Health and Safety 5 Year Plan establishes a series of measures that will enable Highways England to improve health and safety performance. The zero-crossing initiative is intended to be a catalyst for further positive action to reduce the risk to Road Workers.

³ For example, car drivers, pedestrians, HGV drivers, motorcyclists

2.3 Methodology for demonstration of meeting the safety objective

2.3.1 Road users

The methodology used to demonstrate that the safety objective can be achieved is described in GG 104 [21]. It is noted that whilst the methodology is generic, the demonstration is specific to the M4 J3-12 SM scheme as the hazards have been assessed specifically for this section of the network.

The flowchart in Figure 2-1 below summarises the process followed:

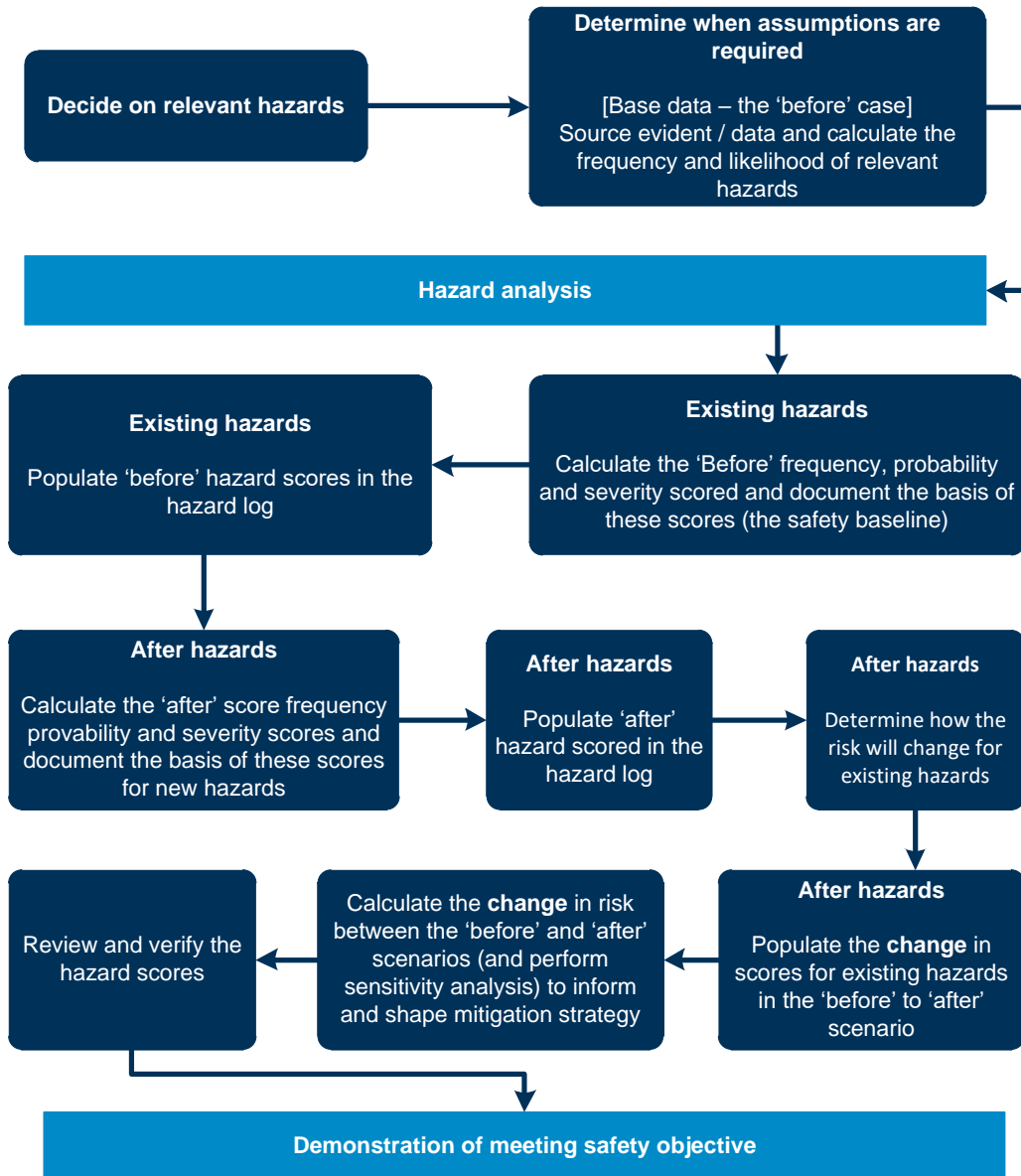


Figure 2-1: Process for demonstration of meeting safety objective

A qualitative risk comparison of the baseline is made with the proposed design to assess whether this design would meet the safety objective. A semi-quantitative consideration of the risk change, based

upon the outputs of the hazard log review, has also been included. Care must be taken not to assume that the numerical output represents a higher degree of precision than is possible given the limited accuracy and availability of input data. To avoid such misinterpretation, the numerical calculations are used as a tool for guiding the construction of a qualitative argument.

2.3.2 Road workers

In addition to considering the impact of the scheme on the safety of all road users the project also considers the safety impact of the scheme for road workers (e.g. traffic officers and maintenance workers).

2.4 Demonstration of meeting the safety objective

2.4.1 Road users

The hazard analysis work undertaken up to SGAR 6 leads to the conclusion that, based on the ALR design requirements set out in IAN 161/13 [2], the M4 J3-12 SM scheme is likely to be safer than the baseline due to:

- A reduction in risk for 12 of the 18 highest scoring existing motorway hazards (i.e. those with a baseline risk score of approximately E08/S08 and above), due to a controlled environment being provided through a combination of regularly spaced mandatory speed signals, speed enforcement and full CCTV coverage
- One high scoring new hazard has been introduced with the implementation of ALR:
 - H113 Vehicle exits emergency area – E08
- One existing high scoring hazard increases in risk with the introduction of ALR:
 - H149 Vehicle drifts off carriageway (i.e. leaving the carriageway as a result of the road environment) (E08.00 to E08.08)
- One existing medium scoring hazard will increase to E08 with the introduction of ALR:
 - H135 Vehicle stops in running lane (off-peak) (E07.81 to E08.31)
- Calculations show that the 'total score' for 'after' represents a reduction of risk of approximately 15% when compared with the safety baseline (no MIDAS queue protection). If MIDAS was included within the safety baseline the scheme would still achieve a circa 5% reduction in risk (as noted in section 2.1 MIDAS has been found to provide a reduction in accidents of around 10%)

This analysis suggests that the scheme is likely to meet its road user safety objective. This conclusion is in line with the generic assessment as documented in the ALR Generic Safety Report [4].

2.4.2 Road workers (maintainers)

The M4 J3-12 hazard log has been used to assess the change in risk for maintainers resulting from the implementation of ALR on the M4 J3-12 SM scheme. The analysis carried out to date suggests that the safety objective for road workers for the scheme can be met with additional mitigation measures

including the use of signalling for roadworks, rationalisation of maintenance activities and the deployment of rigid concrete barrier (RCB).

2.4.3 Road workers (traffic officers)

The project has assessed changes in risk to traffic officers through the introduction of ALR on the M4 J3-12 SM scheme. The analysis shows that the safety objective for traffic officers is expected to be achieved.

A key mitigation that will be introduced by the M4 J3-12 SM scheme is the concept of a controlled environment. A controlled environment provides the driver (road user) with the right (i.e. relevant, timely and accurate) information, at the right location at the right time, thereby promoting appropriate and intuitive driver behaviour. The definition of a controlled environment is detailed in the Major Projects' Instruction (MPI) 'Definition of a Controlled Environment' [29]. The ability to set lane closure signals will support and protect road workers attending live lane incidents. Driver education campaigns will also be expected to address issues with red 'X' compliance, some of the causes of breakdowns and reduce those that occur in live lanes. The Operations Directorate has enhanced carriageway clearance capability for traffic officer vehicles to allow heavier vehicles to be moved to a place of relative safety. However, in some circumstances the capabilities will be exceeded, so specialist recovery services will be required.

Additionally, the results of three-year monitoring of the first ALR schemes on the M25 J23-27 and M25 J5-6/7 indicate that introducing ALR does not negatively impact the safety of all populations. Despite increasing traffic flows, both schemes have met the safety objectives of:

- No increase in the number of fatal and weighted injury (FWI) casualties; FWI rates have improved on both schemes
- No user group has been adversely affected

3. Has a safety risk assessment process been followed?

This section demonstrates that:

- An appropriate activity categorisation has been selected and applied
- The project has been resourced with competent people to carry out the safety work
- A robust safety approvals process is in place
- Plans are expected to be put in place to monitor project safety performance
- The Combined Safety and Hazard Log Report will be maintained

3.1 Activity categorisation

3.1.1 Categorisation

GG 104 [21] describes the process by which the activity categorisation is selected for smart motorway schemes. With the level of knowledge in the design and operation of ALR since the delivery of the M42 smart motorway scheme, in general, all ALR schemes are type B by default; however it has been recognised by the National Safety Control Review Group (NSCRG) that some schemes might contain some 'type C issues'. This is true of the ALR design requirement, due to the impact on road workers with the conversion of the hard shoulder to a permanent running lane, as recorded in the ALR Generic Safety Report [4].

The M4 J3–12 SM scheme Safety Plan [1] describes the process and justification by which the activity category was selected for this scheme. The activity categorisation types for the M4 J3–12 SM scheme are defined in the bullet points below in line with GG 104 [21]:

- Five type B features noted as '**extent of prior experience of activity**', '**statutory and formal processes and procedures (including standards and legislation)**', '**impact on organisation**', '**activity scale**' and '**technical**'
- One type C features noted as '**significant interest from key stakeholders**'

Overall, the M4 J3-12 SM scheme has been categorised as type B. This is in line with other smart motorway schemes.

3.1.2 Proposed project safety risk assessment process

The M4 J3-12 SM scheme Safety Plan [1] details the requirements for a type B activity and how these have been delivered for this scheme. GG 104 [21] documents the process for assessing type C features. The following items were undertaken to address the type C issue.

Stakeholders

The Operations and Safety workstream has supported stakeholder liaison by providing suitable advice for key liaison meetings and to address issues raised by stakeholders. Highways England has

undertaken a series of national workshops with the emergency services to work through how they would attend and manage incidents on an ALR designed scheme. Discussions continued with the emergency services throughout PCF Stage 6 in regard of their concerns about safety, in particular towards vehicles stopping in live lanes off peak and the reverse access procedure.

Signalling for roadworks

Signalling for roadworks has been identified as a type C issue, so was taken to NSCRG for acceptance in November 2019.

3.2 Key project safety roles and responsibilities

The key safety related roles specified are listed below in Table 3-1:

Table 3-1: Safety specific roles

Role	Responsibilities
Project Consultant	Accountable for ensuring the quality and timeliness of all of the operational safety products as defined in the project control framework (PCF) matrix.
Operations and safety lead	Responsible for managing delivery of all of the operations and safety products as defined in the PCF matrix.
Safety subject matter expert (SME)	Provides safety support to the scheme as required and is chair of the SCRG meetings.
Principal Designer	The Principal Designer will provide control over the pre-construction phase and will have an important role in influencing how risks to health and safety are managed.
SCRG (formerly Project Safety Control Review Group (SCRG))	The SCRG provides a forum for checking and endorsing safety work before it is submitted for any wider approval. As well as reviewing safety work, the SCRG also reviews significant departures from standard associated with the M4 J3-12 SM scheme and wider scheme specific safety issues. The remit for M4 J3-12 SM scheme SCRG was presented and accepted at the first M4 J3-12 SM scheme SCRG on 26 March 2013 [6]. The remit was last reviewed, updated and presented at the SCRG meeting on 28 th April 2016. The results from the review of the scheme hazard log at SGAR 5 were presented at the SCRG held on 15 th December 2016. A review of the highest scoring hazards was presented and accepted for the interim Stage 6 on 16 th May 2019.
NSCRG	The NSCRG reviews and advises on complex, unique or contentious safety issues that are referred to it from SCRGs, and accepts solutions

Role	Responsibilities
	<p>developed by SCRGs. The NSCRG undertakes periodic reviews of the recommendations and decisions made at individual SCRGs to maintain consistency.</p>
<p>Operations Technical Leadership Group (Ops TLG)</p>	<p>The Operations TLG provides a forum for specialists from the various organisations working on smart motorway schemes to share information, good practice and design solutions; and to review/assess and solve key issues affecting schemes. It is facilitated and run from the smart motorways programme team.</p> <ul style="list-style-type: none"> • The M4 J3-12 SM scheme presented its operating solution at PCF Stage 3 in January 2015 in accordance with MPI-31-082014 [24] • The scheme presented to Ops TLG three times during PCF Stage 5 on 21st April 2016, 14th September 2017 and 8th March 2018 as well as an interim Ops ‘Surgery’ on 16th December 2016: The scheme secured the Stage 5 TLG certificate in April 2018 • The scheme returned to Ops TLG during Stage 6 to present the value engineering design changes on 12th September 2019 • The scheme will return to Ops TLG ahead of SGAR 7 to present the performance reports for the live scheme.

3.3 Safety acceptance and approval process

A safety acceptance and approvals process for a project is defined to provide a clear route for:

- Scheme safety documentation approval (including the approval of the Combined Safety and Hazard Log Report)
- Final scheme approval, hence a means of obtaining the consent that is needed to commence operation

Highways England has specified the approval process for PCF deliverables. This approach for sign off is captured in the ‘document control sheet’ and the sign-off sheet at the front of this Combined Safety and Hazard Log Report.

3.4 Monitoring

The following monitoring activities will be incorporated:

- Implementation of the plan for monitoring operations (PfMO)
- A Benefits Realisation and Evaluation Plan (BREP) assessment

- Stage 4 road safety audit at 12 months of operation
- Assessment of operational monitoring reports, for example from the traffic officers or maintainers

The PfMO [27] describing the monitoring and control requirements has been completed. This aligns with the Highways England Framework for the monitoring and evaluation of smart motorway schemes. This activity can therefore only be concluded after the scheme is completed. Scheme specific monitoring is expected to cover the following topics:

- M4 J7 entry slip signals (ESS)
- M4 J5 to J4b eastbound – provision of fifth lane after Sutton Lane Bridge
- Provision of emergency areas between M4 J3 to J4 westbound and eastbound
- Performance of the retained vehicle restraint system (VRS) on the Langley Junction (J5) underbridges
- Removal of street lighting at J7-J8/9 and J10-J12
- Operation of access and egress slip roads to scheme compound between J10-J8/9 Eastbound⁴

3.5 Summary of Safety Related Departures

The M4 J3-12 SM scheme is subject to safety related departures and key mitigations. During PCF Stage 3, 72 departures from standard (DFS) were identified. During PCF Stage 5, the number of departures increased to 169. In Stage 5, there was one departure with a red status, which was for the provision of 5-lane ALR motorway which is fundamental for the operation of the J4 to J4b (both directions) link and on J5-4b (after Sutton Lane overbridge) where there is an extended diverge. This has now been approved and there are no departures with a red status.

The full list of departures is listed in the DFS Checklist PCF product [30].

3.6 Summary of SCRG acceptances

Several scheme specific safety issues have been identified and resolved with acceptance at the scheme's SCRG. Appendix D identifies these issues and details the status of the issue as of June 2020.

3.7 Versions of the Combined Safety and Hazard Log Report

The Combined Safety and Hazard Log Report was initially produced for SGAR 3. The previous version of this report was produced for SGAR 5. The anticipated versions of the Combined Safety and Hazard Log Report are:

- **Pre-operation SGAR 6 versions:** This version has been produced for SGAR 6. This product will be updated and issued for full SGAR 6 as each section is opened to demonstrate that the

⁴ These slip roads will be in operation after J8/9 – J10 has been opened and will be decommissioned after the full scheme opening.

scheme is able to meet the required level of safety prior to commencement of operation. This includes demonstrating that the infrastructure, technology and equipment have been designed, constructed, installed and commissioned correctly and that suitable procedures for operation and maintenance are in place

- **Final (SGAR 7) version:** The purpose of the 'final' version of the Combined Safety and Hazard Log Report is to close out the safety work for the scheme. It confirms that either the safety activities have been completed or, if they are not completed, that the safety risk associated with them is acceptable. This version is produced after significant operating experience has been gained. Typically, this experience would be of the order of a year. Although this Combined Safety and Hazard Log Report is titled "final", future versions of the report will be needed if:
 - An additional hazard is identified that needs mitigation
 - Changes are made to the scheme to which the safety report relates

4. Have hazards been well managed?

This section demonstrates that:

- An appropriate risk assessment methodology, hazard log and set of hazards have been applied
- All scheme hazards have been analysed during stages 3 and 5 and the top scoring hazards have been further reviewed at stage 6
- The project safety requirements have been identified

4.1 Risk assessment methodology, hazard log and set of hazards

4.1.1 Generic methodology

The risk assessment methodology applied is encapsulated in the generic smart motorways hazard log. The generic smart motorways hazard log was used as the starting point for the risk assessment process for the M4 J3-12 SM scheme. The hazard log prescribes the format used to assess hazards and record the outcome of the assessment. It also contains a set of generic smart motorway hazards that form the starting point for the risk analysis.

From this generic smart motorway hazard log [17] a list of specific hazards and their scores has been developed for the M4 J3-12 SM scheme and documented in the scheme specific hazard log [18]. Hazards are categorised as 'Event' or 'State' hazards, each hazard consisting of three parameters as detailed in Figure 4-1 (further detail on the risk assessment methodology can be found in the M4 J3-12 SM scheme Safety Plan [1]).

For existing hazards, i.e. those hazards that exist before and after the implementation of the scheme, changes in risk as a result of the scheme implementation are simply added to or taken away from the numeric part of the risk score. For example, if the before risk for a hazard is scored as E08 and the reduction in risk is 0.2, the resulting 'after' score is E07.8.

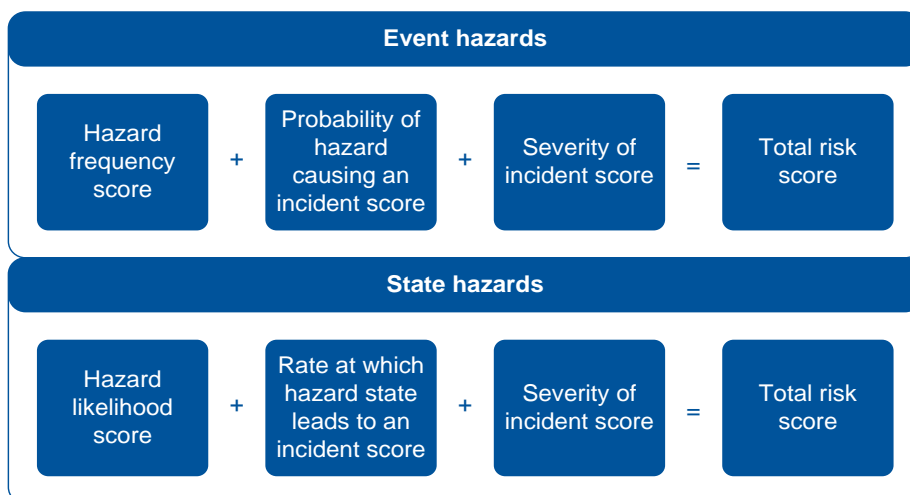


Figure 4-1: Calculation of 'event' and 'state' hazard risk scores

Calculating risk scores for event and state hazards:

- Risk scores for both event and state hazards consist of three parameters
- Each parameter is ranked and given a score
- The scores for the three parameters are then added together to give an overall risk score
 - Parameters vary depending on whether the hazard is an event or a state
 - It is not possible to do direct risk comparisons of event and state hazards
- The overall risk can range from
 - Minimum score of E00 / S00
 - Maximum score of E12 / S12
- A difference of 1 in the overall risk scores implies a 10 times difference in risk (logarithmic) e.g. an E08 hazard has a 10 times higher risk than an E07

4.1.2 Methodology application

Wherever possible risk scores are based on specific data for the M4 J3-12 SM section, e.g. number of broken-down vehicles, number of lane closures, traffic flows etc.

The risk scores were reviewed with the information currently available and where necessary revised to reflect the impact of the design decisions and assumptions.

4.2 Analysis of hazards

4.2.1 Approach to assessment of hazards

All hazards were assessed at stages 3 and 5. At SGAR 5 the 18 top scoring hazards constituted 92% of total baseline risk. At this stage (Stage 6) the 18 top scoring hazards have been reassessed and reviewed considering:

- Value engineering design changes. These changes have been outlined in the below table with key conclusions and safety implications from the relevant safety risk assessment or operational assessment

Value engineering design change	Key conclusions	Safety implications
<p>Use of signalling for roadworks instead of ROTTMS: following a successful trial of signalling for roadworks, ROTTMS have been removed from the scheme design.</p>	<p>Status: Safety risk assessment being finalised, key conclusions and safety implications to be included in next iteration. This was accepted by NSCRG in November 2019 .</p>	
<p>Removal of TJR at J6, 8/9 and 11: significant saving and operational benefits have been identified by applying IAN 161/15 guidance on the provision of TJR. An updated safety and operations assessment showed that TJR could be removed at J6, 8/9 and 11.</p>	<ul style="list-style-type: none"> • The M4 Non-TJR Safety Risk Assessment [35] concludes that changes to the layout of J7 are not proposed due to the operational risks associated with forecast flows through the junction • It is proposed to change the layout of J6, J8/9 and J11 due to the operational benefits which outweigh the risks associated with reduction in capacity for traffic through the junction • This has been accepted by NSCRG on 27th November 2019 and documented in the minutes from this meeting [41]. 	<ul style="list-style-type: none"> • Likely to result in less weaving when entering and exiting the junctions • There is no further evidence to support collisions occurring as a result of removal of TJR • Removal of TJR permits road users who break down to attempt manoeuvres to a place of relative safety • A review of the M4 J3 – 12 SM scheme hazard log’s top scoring hazards noted the following changes to hazard scoring <ul style="list-style-type: none"> ○ H89 Sudden weaving at exit point, baseline E8.0, reduces to E7.98 (with TJR), reduces to E7.96 with no TJR (5% reduction from TJR) ○ H112 Vehicle enters main carriageway unsafely, baseline E8.0, reduces to E7.94 (with TJR), reduces to E7.88 with no TJR (13% reduction from TJR)

Value engineering design change	Key conclusions	Safety implications
<p>Ramp metering removal at J5 EB, J6 EB and J7 EB: a decision was accepted at SCRG to decommission ramp metering sites at J5 EB, J6 EB and J7 EB. This decision is awaiting confirmation from Highways England via a Project Management Instruction.</p>	<ul style="list-style-type: none"> • Each ramp metering site has been assessed in the operational assessment [34] against the following factors <ul style="list-style-type: none"> ○ Is ramp metering needed to support traffic flow? ○ Is ramp metering cost effective? ○ Will ramp metering work with the proposed slip road layout? • It was assessed that the slip road layouts at J5 EB, J6 EB and J7 EB were not compatible with ramp metering 	<ul style="list-style-type: none"> • It was deemed that for J5 EB, J6 EB and J7 EB ramp metering is not required to support the ease of congestion, so there is likely to be no safety impact of removing it
<p>Street lighting removal from J7-J12: decisions have been made to remove lighting on the main carriageway at J6 and from J7 to J8/9 and J10-12 but lighting will be retained through junction 7.</p>	<ul style="list-style-type: none"> • The road safety lighting review [32] concludes that mainline road lighting is retained along the carriageway for links J3-7 • The existing mainline road lighting is removed and not replaced at J6 and from links: <ul style="list-style-type: none"> ○ J7-J8/9 ○ J10-J12 	<ul style="list-style-type: none"> • It is not anticipated that removing the mainline lighting will result in an increase in the number of collisions in comparison to a design where the lighting is retained, subject to the provision of: <ul style="list-style-type: none"> ○ Speed enforcement cameras ○ A variable mandatory speed limit ○ CCTV
<p>Environmental barrier door spacings: the design will be amended from 200m centres to 400m.</p>	<p>Status: Safety risk assessment being finalised, key conclusions and safety implications to be included in next iteration.</p>	

Value engineering design change	Key conclusions	Safety implications
<p>CCTV provision: the total number of cameras could be reduced from 139 to 113 and 62 of these can be mounted on the gantry structures.</p>	<ul style="list-style-type: none"> The risk associated with the provision of CCTV on MS4 and gantries has been evaluated in the safety risk assessment [33] using a semi-quantitative process 	<ul style="list-style-type: none"> From the results the risk classification for traffic officers and road workers is considered to remain low with the new mounting option The risk classification for road users is considered to remain low for both mounting options. For road users the proposal to mount CCTV units on MS4s and gantries is predicted to: <ul style="list-style-type: none"> have little effect on the likelihood of verge side infrastructure collisions in comparison to additional CCTV masts in the verge, although there is a slight decrease in probability due to the number of infrastructure items reduce the frequency of temporary works reducing risk exposure

Table 2: Value engineering design changes and associated safety implications

- Scheme design changes at the end of SGAR 5, including
 - Additional emergency area (intra-junction) at J4 (five were added at the end of SGAR 5, however four of these are no longer included in the design due to the removal of TJR at J6, J8/9 and J11)
 - No longer widening Langley (therefore no TJR at J5)
 - New specific short-term feature – access / egress to Compound 3C
 - No turnaround point between J8/9 and J10
 - Orange colour of emergency areas
 - A short stretch without RCB at Langley due to constraints on the bridge
- Updates to generic and scheme specific data; and
- The implementation of MPI 66 [26] for items applicable to Tranche 2 schemes.

Medium scoring hazards and population specific hazards (outlined in Appendix F) scores have been updated if any have changed in light of updates to assumptions. These have not been reviewed for Stage 6.

4.2.2 Overview of significant hazard assessment

The M4 J3-12 SM scheme hazard log contains some 100 individual hazards. The highest risk hazards are considered to have a score of 8.0 or higher:

- Hazards with score of E08/S08 or above = totalling approximately 92% of total 'baseline' risk
- Hazards with score of E07/S07 or above = totalling approximately 99% of total 'baseline' risk

The highest scoring hazards are displayed in the Table 4-1 below versus the generic ALR score to provide a comparison and commentary for the justification of the scheme score. An overview of the scores for medium scoring hazards (those with score of 7.0 or 7.5) is available in Appendix F - Medium scoring hazards. Scores for hazards associated with specific populations are shown in Appendix G - Specific population hazards. Table 4-3 **Error! Reference source not found.** uses the following colour coding:

Table 4-3: Change to hazard risk key

RAG	
Green	Decreases in hazard risk score (-)
Red	Increases in hazard risk score (+)

The overall result of the hazard assessment to date indicates that there will be a number of significant safety benefits realised on completion of the M4 J3-12 SM scheme **Error! Reference source not found.**:

- 12 high scoring hazards reducing in risk
- 1 high scoring hazard increasing in risk, and one hazard becomes a high scoring hazard

- 2 new hazards introduced because of implementation of ALR (one of which is a high scoring hazard)

There is on-going work at a national level to update the generic ALR hazard log as and when new data becomes available. When any updates and changes are made to the generic ALR hazard log, the M4 J3–12 SM scheme hazard log will be reviewed and updated as necessary to reflect these changes.

Table 4-4: Highest scoring hazards for the M4 J3-12 SM scheme

Haz. ref.	Hazard description	Event / State	Generic hazard scoring						Scheme hazard scoring (SGAR 6)					
			F	P	S	Before (B)	After (A)	Justifications	F	P	S	B	A	Justifications
H37	Individual vehicle is driven too fast	S	6	2	1	9.00	8.76	Considerable benefit from the controlled environment during the peak but also benefit off-peak (compliance with national speed limit).	6	2	1	9.00	8.76	No change from generic
H138	Driver Fatigued - unable to perceive hazards effectively	E	6	2	1	9.00	9.00	No change. No benefit from ALR, especially off-peak when signs and signals are off.	6	2	1	9.00	8.99	Presence of motorway service area (MSA) between J11 and J12, which should help decrease driver fatigue slightly
H67	Pedestrian in running lane - live traffic	E	4.5	2	2	8.50	8.50	Benefit from the controlled environment. However more instances due to increase in live lane breakdowns (LLBs).	4.5	2	2	8.50	8.50	No change from generic
H76	Rapid change of general vehicle speed	E	6	2	0.5	8.50	8.26	Considerable benefit from the controlled environment during the peak.	6	2	0.5	8.50	8.26	No change from generic
H91	Tail gating	S	6	2	0.5	8.50	8.20	Considerable benefit from the controlled environment during the peak.	6	2	0.5	8.50	8.20	No change from generic
H11	Driver ignores closed lane(s) signals that are protecting an incident	E	6	1	1	8.00	8.00	More robust and more frequent signaling: controlled environment perception for motorists; but more LLBs and monitoring of first ALR schemes shows lack of driver compliance with Red X signals	6	1	1	8.00	8.00	No change from generic
H13	Driver loses control of vehicle	E	4	3	1	8.00	7.90	Some benefit from controlled environment	4	3	1	8.00	7.90	No change from generic
H54	Motorcycles filter through traffic	E	6	0	2	8.00	7.90	Benefit from controlled environment. Smoother traffic travelling at higher speeds - less need to filter through	6	0	2	8.00	7.90	No change from generic
H89	Sudden weaving at exit point	E	6	1	1	8.00	7.98	Very slight benefit from controlled environment	6	1	1	8.00	7.96	Removal of TJR will add slightly more benefit to this hazard than the generic case
H103	Unsafe lane changing (mid link)	E	6	1	1	8.00	7.88	Some benefit from controlled environment	6	1	1	8.00	7.88	No change from generic
H112	Vehicle enters main carriageway unsafely	E	6	1	1	8.00	7.94	Some benefit from controlled environment based upon optimum provision as outlined through an overrun assessment	6	1	1	8.00	7.88	Slight difference due to higher traffic peak volumes and non-TJR
H120	Vehicle re-joins running lane from hard shoulder / verge	E	6	1	1	8.00	7.90	Non-emergency stops are effectively eliminated and most remaining stops will be in refuge areas	6	1	1	8.00	7.95	Slight difference to generic as a result of more hard shoulder sections being present where there is no TJR in operation
H121	Vehicle reversing along exit slip	E	4	2	2	8.00	7.90	Some benefit from controlled environment	4	2	2	8.00	7.90	No change from generic
H149	Vehicle drifts off carriageway (i.e. leaving the carriageway as a result of road environment)	E	3	4	1	8.00	8.08	Slight increase in risk as some traffic is travelling nearer the edge of the carriageway and at national speed during off peak times.	3	4	1	8.00	8.08	No change from generic
H154	Vehicle stopped on hard shoulder (D3M) or verge (ALR)	S	5	1	2	8.00	6.50	Elimination of the hard shoulder will result in a significant reduction in stops	5	1	2	8.00	6.60	Slightly worse than generic ALR as there are more hard shoulder sections where there is no TJR in operation
H52	Maintenance workers setting up and taking down work site	S	3.86	2	2	7.86	7.86	Hazard score identified from Highways England road worker safety assessment tool	3.86	2	2	7.86	7.86	No change from generic
H135	Vehicle Stops in Running Lane - Off Peak (Event)	E	4.8	1.5	1.5	7.81	8.31	An increase in risk is anticipated reflecting a substantial increase in the frequency of vehicles stopping in a running lane.	4.8	1.5	1.5	7.81	8.26	Likely to be slightly better than generic ALR as result of more hard shoulder retained for non-TJR sections
H113	Vehicle exits emergency area	E	6	1	1	0.00	8.00	ALR introduced hazard	6	1	1	0.00	8.00	No change from generic
H152	Vehicle recovered from emergency area	E	5	1	1	0.00	7.00	ALR introduced hazard, but not a top scoring hazard	5	1	1	0.00	7.00	No change from generic

4.3 Safety requirements

Scheme specific safety requirements for the M4 J3-12 SM scheme have been developed based on the generic ALR safety requirements, which are detailed in the ALR Generic Safety Report [4]. The M4 J3-12 SM scheme safety requirements are documented in Appendix E – Scheme safety requirements.

5. Have appropriate methods and processes been followed during project execution?

This section demonstrates that:

- The M4 J3-12 SM scheme design is compatible with standards, guidelines and regulations
- Good practice and project wide systems have been and will be followed during project execution
- Stakeholders have been engaged

5.1 Compatibility of design with standards and legislation

Wherever practicable the scheme complies with the requirements set out in the Design Manual for Roads and Bridges (DMRB). Where it has not been possible to comply with a requirement of the DMRB for the purpose of agreed value engineering (VE) opportunities or due to physical constraints on the scheme this will be detailed within the scheme Design Strategy Record (DSR) [28] or a DFS has been sought. One example of this is the existing metal VRS will be retained instead of concrete barrier in the central reserve on the Langley Junction underbridges at J5 because the bridge is unable to accommodate the concrete barrier. All inclusions within the DSR or DFS submissions are supported with safety work and also additional individual safety reviews and workshops as required. A summary of the departures for the scheme is provided within section 3.5. Details of the safety risk assessments undertaken are included in Appendix H – Safety risk assessments for the M4 J3-12 SM scheme.

The scheme was designed in accordance with the design principles set out in IAN 161/13 [2]. Consequently, a review has been undertaken to understand the differences between IAN 161/13 and IAN 161/15 [3] and MPI 66 and recognise where new requirements have been included in the more recent standards. The project team has explored the possibility of adopting requirements in IAN 161/15 and MPI 66 and where practicable these have been incorporated unless restricted by the DCO.

Where the scheme has had to adapt or relax requirements, this has been captured in the Design Strategy Record [28] with DFS agreed where required.

Monitoring will be carried out post implementation to monitor the scheme's performance, as discussed in section 3.4. Attention will be paid to the elements of the scheme that required significant departures.

The scheme will conform to the legal requirements associated with implementing an ALR scheme, this includes compliance with the DCO, the DMRB and Traffic Signs Regulations and General Directions (TSRGD). The statutory instrument will ensure legal compliance with the speed limits on display. No features will be introduced that are likely to have their legal status challenged.

The scheme has design responsibilities under The Construction (Design and Management) Regulations (CDM Regulations) and the need to take account of the safety levels currently available on any third-party interfacing assets which may be modified because of the implementation of the scheme.

5.2 Good practice

Good practice has been demonstrated by the involvement of external stakeholders, the procedures used to control the project and the detailed (evidence-based) design investigations carried out and presented by the project team. Key items include:

- **Regular reporting to Highways England** – Written progress reports have been submitted to Highways England at monthly intervals. These cover all workstreams and describe the work completed in the last period and the plan for work to be completed in the next period, any project risks or issues were highlighted.
- **Project risk assessment** – A project risk register has been maintained and updated on a regular basis. This includes the safety impact of risks.
- **Document review and approval** – All documents formally issued on the project go through a review and approval process. Each document is signed by the author, checker, reviewer and the person who authorises it for issue, who must be a senior / suitably experienced member of the design project team. These documents are then passed to Highways England for review. If changes are requested, a new issue of the document is prepared and the review and approval cycle is repeated. The Safety Plan and Combined Safety and Hazard Log Report are PCF products and require higher level sign-off in line with the requirements for all PCF products. In addition, an approval sheet needs to be signed for key safety deliverables in line with requirements set out by the NSCRG.
- **Document management** – All documents formally issued on the project are collated within the project directory hosted on Project Wise. Documents relevant to other team members are distributed either by e-mail or as paper copies.
- **Quality system** – The Arcadis-Jacobs Joint Venture operate a quality system to ISO 9001, against which it is regularly audited.
- **Stakeholder engagement** – The relationships with external stakeholders have been two way and timely to ensure they are fully bought into the design development process. All communications have been tailored to the needs of the stakeholder and also aligned with the overall communication strategy. More detail on stakeholder engagement is outlined in the next section.
- **Safety risk assessment** – GG 104 has been applied for selecting an activity categorisation and developing and implementing safety risk assessment activities.

5.3 Stakeholder engagement

An integral part of the scheme's development has been the consultation undertaken prior to the submission of the DCO, in line with legislative requirements. In line with the scheme's consultation

strategy, outlined in the scheme Consultation Report [25], a comprehensive information exercise and engagement with local communities, local authorities, as well as statutory and non-statutory consultees likely to be affected by development proposals, was undertaken. This was also important in helping members of the public and interested parties to better understand the scheme proposals. The process also assisted in providing a better opportunity for interested parties to influence the scheme, whilst allowing Highways England, as applicant to obtain important information about the impacts of the proposal on the communities affected.

In addition to this consultation stakeholders have also been engaged regularly throughout the scheme development with respect to the safety performance of the scheme, this has included:

- The stakeholders on the scheme through SCRG
- Presentation to the Highways England Ops TLG
- Engagements with the Highways England Operations Directorate and core responders as described in the Combined Operations PCF Product
- Engagement with the emergency services
- Engagement with the Maintenance Service Providers through regular Maintenance Forum meetings as described in the Maintenance and Repair Statement (MRS)

6. Conclusion

6.1 Conclusions

This document is the Combined Safety and Hazard Log Report (SGAR 6 version) for the M4 J3-12 SM scheme. The purpose of the report is to demonstrate at SGAR 6 that the appropriate level of safety risk assessment has been undertaken to assess the expected safety performance for the implementation of smart motorway on the M4 J3-12.

The information presented in this report demonstrates that:

A safety objective has been set for the scheme and is likely to be achieved.

The generic assessment of ALR schemes assumes that motorway incident detection and automatic signalling (MIDAS) is not in place prior to installation of ALR. MIDAS is already installed on the M4 J3-12 section. In order to take account of this, the safety baseline is amended to:

- 110% of the number (averaged per annum) of fatal and weighted injury (FWI) casualties and the rate of FWIs per billion vehicle miles per annum averaged for the three years prior to scheme implementation
- The scheme will satisfy the safety objective if both of the key indicators below are demonstrated to be better than the safety baseline for the three years after full scheme opening:
 - Number of FWI casualties, and
 - Rate of FWI casualties per billion vehicle miles
- The M4 J3-12 SM scheme is expected to provide safety benefits and meet its road user safety objective due to the improved standards that will be achieved on this route from implementing the new ALR configurations, which compensate for the conversion of the hard shoulder into a running lane
- The risk to road workers must be managed in accordance with the requirements of the Health and Safety at Work Act etc As Low As Is Reasonably Practicable. There will be no specific numerical safety objective set for road workers
- At this stage, application of the M4 J3-12 SM scheme hazard log tool indicates that the road worker safety objective will be achieved for M4 J3-12 SM scheme through the installation of rigid concrete barrier and the use of signalling for roadworks

An appropriate categorisation of activity type has been selected for the project and has been applied

- The categorisation of activity process is documented in the scheme Safety Plan [1], which recommended a type B with one type C issue for the M4 J3-12 SM scheme. This is a result of a significant interest from key stakeholders (type C). The safety assessment has been undertaken in accordance with GG 104 [21]

- These issues suggest that the standard type B categorisation of activity should be supplemented with some additional activities e.g. regular engagement with stakeholders. This aligns with the ALR interim advice note (IAN) 161/13 [2] design requirement
- The project has been resourced with competent people to carry out the safety work
- A robust safety approvals process is in place for safety documents
- The Plan for Monitoring Operations [27] describing the monitoring and control requirements will be available before operation commences
- The Combined Safety and Hazard Log Report will be handed over to Highways England for operation and maintenance after project completion
- All safety risk assessments developed during this project are included as an annex document to this report. A summary table is included in Appendix H

Hazards are well managed

A SCRG meeting for the M4 J3-12 scheme was held on 26th March 2013 at which the outcomes of the preliminary road worker safety assessment were reviewed and accepted. A further SCRG meeting held on 14th May 2013 reviewed and accepted the significant hazards associated with the scheme as assessed at that stage of the project.

Following publication of IAN161/13 [2] and the associated ALR Generic Safety Report [4], the scores for some hazards have been changed to reflect the updates in the generic IAN161/13 hazard log. The highest risk hazard scores for the M4 J8/9-12 section were reviewed at SCRG meetings on 12th September 2013 and 28th November 2013. The scores for M4 J3–12 SM scheme were reviewed and these were in line with the highest risk scores accepted for the M4 J8/9–12 section. Following ongoing design development further SCRG reviews of the M4 J3–12 SM scheme were conducted at meetings on 11th December 2014 and 5th February 2015.

Following publication of IAN 161/15 [3] and the results of the three year monitoring of the first ALR schemes on the M25 J23-27 and M25 J5-7, some assumptions and hazard score calculation from the generic ALR hazard log were updated [15] [16]. The scheme specific M4 J3–12 SM scheme hazard log has been updated in line with updates and changes made to the generic ALR hazard log. Following this update the high scoring hazards were reviewed at a SCRG meeting on 15th December 2016.

The high scoring hazard scores were reviewed initially for PCF Stage 6, with no required changes identified. The approach and outcome of the review was presented SCRG on 16th May 2019. The high scoring hazard scores have been reviewed again following the value engineering design changes with some small amendments made.

Appropriate methods and processes are being used in delivering the project

- Most of the components on the M4 J3-12 SM scheme will be as per the requirements of IAN161/13 [2] for ALR schemes. However, some locations will have a different provision mainly due to specific constraints (e.g. the existing metal VRS will be retained instead of concrete

barrier in the central reserve on the Langley Junction underbridges at J5 because the bridge is unable to accommodate the concrete barrier)

- Good practice and project wide systems are being followed during project execution

6.2 Summary

It can be concluded from the information summarised in this Combined Safety and Hazard Log Report that the objective to “demonstrate at SGAR 6 that the appropriate level of safety risk assessment has been undertaken to assess the expected safety performance for the implementation of smart motorway on the M4 J3-12 SM scheme” has been met.

Appendix A – References

[1] M4 J3–12 Smart Motorway Safety Plan
[2] Interim Advice Note 161/13, Managed Motorways – All Lanes Running
[3] Interim Advice Note 161/15, Managed Motorways – All Lanes Running
[4] 1039092-GSR-016 ALR Generic Safety Report
[5] Management Arrangement of Safety Risk for Highways England Activities
[6] M4 J3-12 SM SCRG minutes 26 th March 2013
[7] M4 J3-12 SM SCRG minutes 14 th May 2013
[8] M4 J8-12 SM SCRG minutes 12 th September 2013
[9] M4 J8 – 12 SM SCRG minutes 28 th November 2013
[10] M4 J3 – 12 SM SCRG minutes 2 nd April 2014
[11] M4 J3-12 SM SCRG minutes 11 th December 2014
[12] M4 J3-12 SM SCRG minutes 5 th February 2015
[13] M4 J3 – 12 Client Scheme Requirements Product
[14] M4 Junctions 3 to 13 Smart Motorway Operations Technical Leadership Group
[15] SM-ALR Monitoring M25 J5-7 Monitoring Third Year Report February 2018
[16] SM-ALR Monitoring M25 J23-27 Monitoring Third Year Report February 2018
[17] ALR generic hazard log
[18] M4 J3 to 12 smart motorways hazard log
[19] M4 J3 to 12 smart motorway Maintenance and Repair Statement (SGAR 5)
[20] GD04/12 – Standard for safety risk assessment on the strategic road network
[21] GG104 – Requirements for safety risk assessment
[22] M4 J3-12 SM SCRG minutes 28 th April 2016
[23] M4 J3-12 SM SCRG minutes 26 th May 2016
[24] MPI-31-082014 Clarification on the role of the Operations TLG and programme board
[25] M4 Junctions 3 to 12 smart motorway, TR010019, 5.1 Consultation report (2015)
[26] MPI-66 – Updated requirements to IAN 161/15
[27] M4 J3–12 Smart Motorway Plan for Monitoring Operations
[28] M4 J3–12 Smart Motorway Design Strategy Record
[29] Major Projects' Instruction (MPI) 'Definition of a Controlled Environment'
[30] Departures from Standard Checklist PCF product
[31] Reported Road Casualties on the Strategic Road Network 2014, 2015 and 2016
[32] M4 J3-J8/9 and J10-J12 Road Safety Lighting Review, June 2019
[33] GD04/12 Safety Risk Report for Relocation of CCTV from masts to Gantries / MS4, May 2019
[34] Re-Assessment of Ramp Metering Sites Technical Note, July 2019
[35] M4 J6, 8/9 and 11 – Non-TJR Safety Risk Assessment, October 2019
[36] M4 J3-12 SM – Value Engineering Through Junction Running Assessment, May 2019
[37] Traffic Signs Regulations and General Directions (TSRGD)

[38] M4 J3-12 SM SCRG minutes 23 rd May 2019

[39] M4 J3-12 SM SCRG minutes 13 th June 2019 (60mph roadworks trial)
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[40] M4 J3-12 SM SCRG minutes 7 th August 2019

[41] 27 th November 2019 NSCRG minutes

[42] M4 J3-12 SM SCRG minutes 14 th May 2020 (60mph roadworks trial)

Appendix B – Glossary of terms and abbreviations

Acronym	Description
ALARP	As Low As Reasonably Practicable
ALR	All lane running
CDM	Construction, Design and Management
DCO	Development Consent Order
DfS	Departure from standard
DMRB	Design Manual for Roads and Bridges
DSR	Design strategy record
D3M	Dual 3 lane motorway
ESS	Entry slip signals
FWI	Fatality and weighted injury
GD	General Direction
GG	General Guidance
GSN	Goal structuring notation
HSR	Hard shoulder running
IAN	Interim advice note
KSI	Killed and seriously injured
MIDAS	Motorway incident detection and automatic signalling
MPI	Major Project Instruction
MS4	Message sign, mark 4
NSCRG	National Safety Control Review Group
PCF	Product control framework
PfMO	Plan for Monitoring Operations
PI	Planning inspectorate
PIC	Personal injury collisions
PRS	Places of relative safety

Acronym	Description
PSCRG	Project Safety Control Review Group
RAG	Red, amber, green
RCB	Rigid concrete barrier
ROC	Regional Operations Centre
ROTTMS	Remotely operated temporary traffic management signs
SCRG	Safety Control Review Group
SGAR	Stage gate assessment review
SM	Smart motorway
SME	Subject matter expert
SRN	Strategic road network
SRO	Senior responsible owner
TJR	Through junction running
TLG	Technical Leadership Group
TM	Traffic management
TSRGD	Traffic Signs Regulations and General Directions (TSRGD)
TTM	Temporary traffic management
VE	Value engineering
VMS	Variable message sign

Appendix C – GSN diagram

Goal-Structuring Notation (GSN)

GSN is used to structure the safety arguments in a graphical manner. A GSN diagram shows how goals are broken down into sub-goals and (where appropriate) supported by evidence, whilst making clear the strategies adopted to meet the goals and the context in which goals are stated. These four entities are depicted by the following shapes:

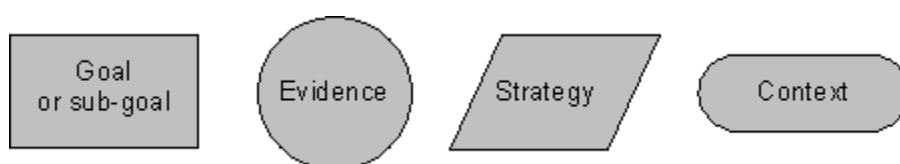
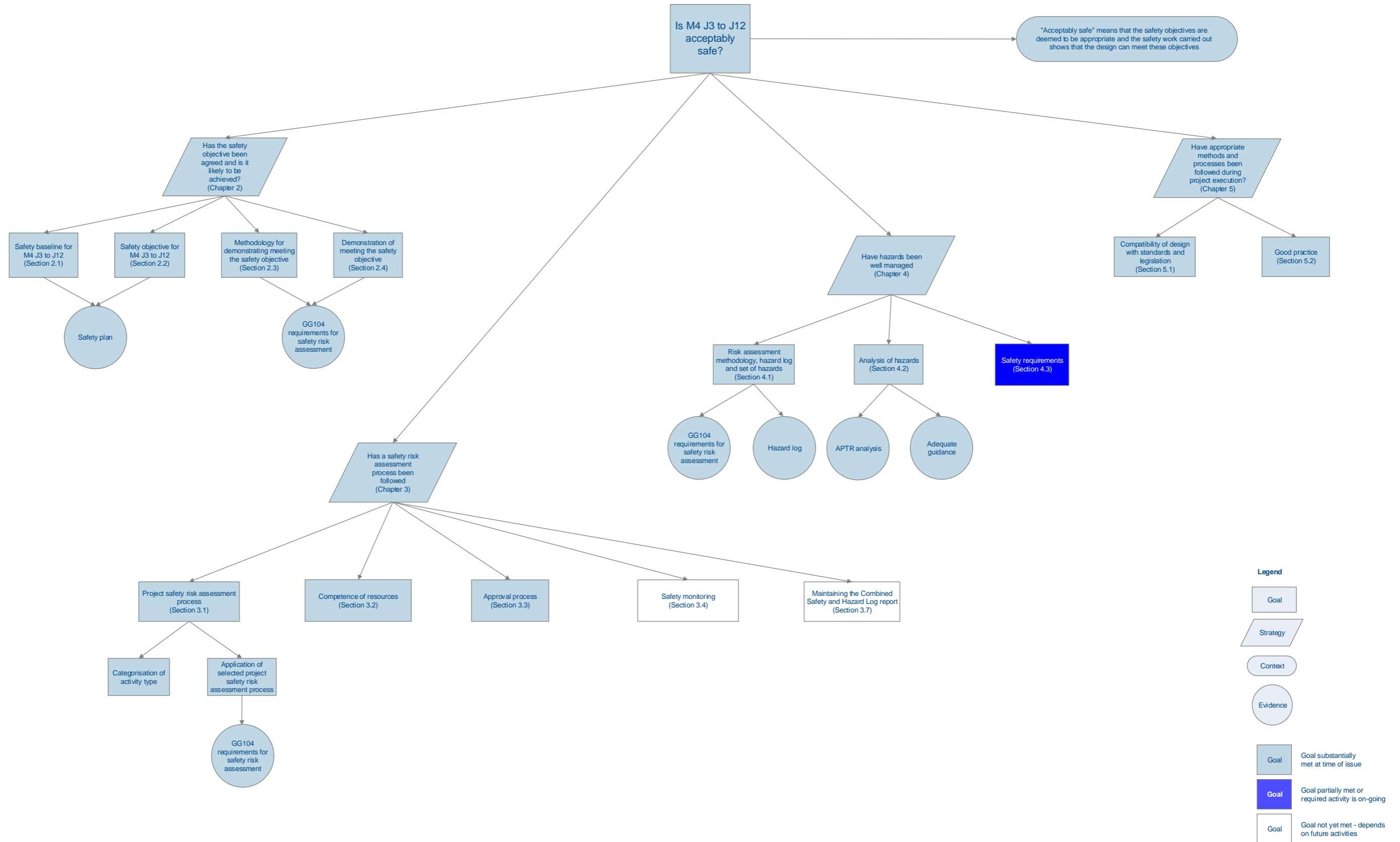


Figure 0-1: GSN shapes

The GSN diagram for the M4 J3-12 SM scheme safety and hazard log report is shown below. Colour is used to denote progress with goals





Appendix D – SCRG Key Issues and Acceptances

Title	Date accepted	Status
Through Junction Running	26/03/2013 14/05/2013	<p>Accepted – In Stage 3, based on the operations and safety impacts presented the following was accepted:</p> <ul style="list-style-type: none"> • TJR should be provided for J11 [default position]; • No TJR should be provided for J3, J4B, J10 and J12 [default position]; and • TJR should be provided for J5, J6, J7, J8/9 • Design to progress to PCF Stage 3 with TJR at J3. Micro simulation should be undertaken at Stage 5.
Signal Visibility Though Junctions	02/04/2014	<p>Accepted - Five locations (J4 westbound (WB), J4bWB, J5 eastbound (EB), J6EB, J8/9WB) were reviewed where visibility of signals through the junction is an issue and where standard signal visibility cannot be achieved.</p>
J7 entry slip signals (ESS)	02/04/2014	<p>Accepted - The design at this location needed to be reviewed by the SCRG as due to the unusual layout of the junction it was not clear within the IAN 161/15 standard where the ESS should be located. Solution accepted to provide a Message Sign 4 (MS4) and overhead Advanced Motorway Indicators (AMI) mounted on a portal gantry over the split of the spur for the east and westbound M4 carriageways.</p>
Strategic Message Signs design	02/04/2014	<p>Accepted - Options for the provision of strategic message signs at J4-4b WB and J5-4b EB were presented. Other strategic message signs are located on the approaches to J8/9 but these signs can be relocated to positions in accordance with IAN 161/15 and therefore did not require acceptance at SCRG.</p>
Ramp Metering retention	02/04/2014	<p>Accepted – In Stage 3 SCRG accepted all recommendations to retain and recalibrate the existing ramp metering (RM) sites with the exception of J12 EB. J12 EB was subsequently accepted during Stage 5 and similarly retained in line with the recommendations of the Ramp Metering Task Force.</p>

Title	Date accepted	Status
Observation Platforms review	19/06/2014	Accepted the options with SCRG should the Police provide strong justification to retain the platforms. Further discussions have been held with the Police and Customer Operations and it is proposed to locate observation platforms at the back of the emergency areas where appropriate.
M4 J5-4b Eastbound	19/06/2014	Accepted - A solution to commence a fifth lane after Sutton Lane Overbridge was accepted.
Lighting Assessment review	04/09/2014 05/12/2017 24/10/2018	Accepted - During Stage 3 SCRG accepted an option to provide lighting from J3 to J6 and at J8/9. This was subject to further investigation into the impact on safety risk for sections where there are constraints/features (such as retaining walls or environmental fencing) that would prevent drivers from reaching areas of safety away from the carriageway. Subsequent to the meeting, the Highways England Project Team instructed that the Scheme will proceed retaining the current lighting layout to mitigate the risk of challenge to the progression of the development Consent Order (DCO) process (i.e. all lit except for J8/9-10 link). Subsequently in Stage 5 SCRG re-accepted the decision to remove the lighting on the main carriageway J6-8/9 and J10-12 subject to a safety risk assessment for Junction 7. Following that assessment, the SCRG acceptance was confirmed for retaining lighting at J7 and the J6-7 link on the main carriageway, therefore the acceptances cover lighting at J3-J7 and no lighting for J7-J12.
Hazard Log Review	14/05/2013, 12/09/2013, 28/11/2013, 05/02/2015	Accepted - High scoring hazards reviewed and accepted.
Road Safety Audit (RSA) Summary	05/02/2015	Accepted - The designer's response to the RSA Stage 1 was reviewed and accepted.

Title	Date accepted	Status
Emergency Area Design Strategy	05/02/2015	<p>Accepted - An emergency area design strategy paper was reviewed and accepted. This included a departure from standard spacing of 2630m at J8/9 EB.</p> <p>Subsequently an additional five intra-junction emergency areas were added to the scheme design to ensure the original spacing decision was met without inclusion of off-slips within the measurements of places of relative safety. This was presented back to SCRG for their information.</p>
Provision of an Emergency Area between J3-4 WB and EB	05/02/2015	<p>Accepted - A review of the location of Emergency areas on the link between J3 and 4 was reviewed and accepted.</p>
Junction operational considerations	05/02/2015	<p>Accepted – Following feedback from the Operations TLG, a paper was accepted which demonstrated that the junction operational considerations have been considered in sufficient detail.</p>
Off Network Access	05/02/2015	<p>Accepted with updated versions of the proposals provided to SCRG through the detailed design phase.</p>
Merge Overruns	05/02/2015	<p>Accepted - a summary of the merge overruns assessment concluded that no extra provisions were required.</p>
Departures Review	05/02/2015	<p>Accepted – recommendation that all Departures from Standard should be a category Type A.</p>

Title	Date accepted	Status
Implementation of reverse access procedure	26/05/2016	<p>Accepted - The use of the national reverse access (RA) procedure on all links on the M4 J3-12 Smart Motorway scheme was discussed at SCRG and it was demonstrated that the RA procedure can be safely implemented on all links on the scheme. SCRG accepted the recommendation that development of the Regional Operating Agreement (ROA) for the M4 J3-12 scheme should continue. In addition, the following next steps should be undertaken:</p> <ul style="list-style-type: none"> • The emergency services forum should consider RA at the motorway to motorway interchanges at J4b and J10 with a view to agreeing preferred access routes and consider RA to the link between junctions 8/9 and 10 with a view to agreeing preferred access routes. • Plans should be developed to undertake desktop exercises ahead of go live to embed understanding of the access routes and the operation of the RA procedure. • Consider how police request for live exercise (similar to the one carried out on the M25) can be accommodated e.g. could this be done whilst the motorway is closed for construction work?
M4 J3-12 - GD04 Assessment for Temporary Road Lighting	26/05/2016	<p>Accepted - The assessment was developed in accordance with GD04 and asked whether not providing temporary road lighting will exacerbate the risk to any population from being broadly acceptable. SCRG accepted the GD04 assessment to not provide road lighting during construction.</p>
Review of the Emergency Area variable message signs (VMS)	26/05/2016	<p>Accepted - IAN 161/15 includes a new requirement for visibility of Emergency areas from upstream VMS. It states "For every ERA (now called emergency area), a VMS shall be located upstream of the ERA such that a vehicle exiting the ERA is visible from all lanes at a point adjacent to this VMS. This is referred to as the ERA VMS. This enables the message "Slow vehicle leaving refuge area" to be set where required". (2.7.23 e)). The M4 J3-12 scheme has 20 emergency areas that meet IAN 161/15 requirements whereas 13 emergency areas do not. Three options were discussed at SCRG:</p>

Title	Date accepted	Status
		<ol style="list-style-type: none"> 1. Leave as is (Baseline) – ‘Do Nothing’ 2. Add distance to message “Slow vehicle leaving refuge area” 3. Remove obstructions such as vegetation where possible to improve sightline to emergency area – note DCO restrictions <p>Each option was reviewed. SCRG accepted that Options 2 and 3 should be progressed.</p>
M4 J4-3 operation of 60mph section	09/09/2016 06/04/2017	<p>Ongoing – The M4 J4-3 60mph section was reviewed to establish the best way to incorporate the maximum 60mph speed limit into the operating and technology regime for the link. The maximum displayable speed of 60mph was being retained on this link for Air Quality benefits and not for safety reasons. Four options were considered:</p> <ul style="list-style-type: none"> • Option A: 24/7 signalling on AMIs • Option B: Fixed Text Message Signs (FTMS) instead of fixed plate MSL sign • Option C: LED signals instead of fixed plate Mandatory Speed Limit (MSL) sign e.g. entry slip signals • Option D: Use of LCD ‘blocker’ in front of fixed plate MSL sign <p>Accepted – in view of the evidence relating to the available options the SCRG accepts the Option A to proceed with 24/7 signalling for the 60mph limit between J4-3.</p>
Hazard Log significant hazards review	15/12/2016	<p>Accepted – The hazard log has been reviewed and updated in line with latest monitoring information from operational ALR schemes. The significant hazards have been presented to SCRG for acceptance.</p>
Combined Operations	26/10/2017	<p>Accepted.</p>

Title	Date accepted	Status
Product (Stage 5)		
Plan for Monitoring Operations (stage 5)	15/12/2016	Accepted.
Removal of TJR at J5 Langley Interchange	21/09/2017	Accepted.
Locations of ROTTMS and fixed taper points	21/09/2017	Part one of the scheme safety risk assessment concludes there is a safety case for the provision of permanent verge ROTTMS, whereas Part two concludes that there is no safety case for the provision of offside ROTTMS, (it is assumed that offside signs will be provided on 5 lane sections). The final ROTTMS assessment for locations was subsequently presented to SCRG during the detailed design stage. Accepted.
Use of a 300mm hardstrip at space constrained locations	26/10/2017	Accepted.
Reduced visibility at Police	26/10/2017	Accepted.

Title	Date accepted	Status
Observation Platform 4		
Modified taper of 1 in 5.9 at Police Observation Platform 1	26/10/2017	Accepted.
Revised signage strategy for J4b-4	26/10/2017	Accepted.
Access and egress to Compound 3C (J10-8/9 Eastbound)	31/08/2018	SCRG accepted the adoption of the safe access and egress from the main carriageway to Compound 3C during all lane running with the proposed mitigations adopted. Also, that the Compound 3C slip roads should be recognised as a scheme specific feature in the Safety Plan.
Positioning of three Emergency Areas between J4b-4 and J4-3 westbound	21/11/2018	<p>SCRG accepted the specific locations of these emergency areas located between half mile signs and exit slips:</p> <ul style="list-style-type: none"> • E2-B1 (J4b-4 Eastbound ch.15100) • E1-A1 (J3-4 Westbound ch.12300) • E2-A1 (J4-4B Westbound ch.15100) <p>This includes the following mitigations:</p> <ul style="list-style-type: none"> • Provision of designated line markings upstream of emergency area • Removal of emergency area green studs to avoid confusion of it being an exit • Specific monitoring of access/egress for these emergency areas to be defined within the Plan for Monitoring Operations

Title	Date accepted	Status
		<ul style="list-style-type: none"> Orange paving to be applied in line with MPI-66 Emergency area signage to be applied in line with MPI-66
Retention of existing VRS on Langley underbridges	21/11/2018	SCRG accepted the recommendation to seek a departure from standard (from IAN 161/13) to retain the existing central reserve VRS on both Langley underbridge structures at J5 with the addition of transition units.
Combined Safety and Hazard Log Report (including hazard log significant hazards review)	16/05/2019	Accepted – The hazard log has been reviewed and updated in line with latest monitoring information from operational ALR schemes and design changes since Stage 5 (not including VE design changes). The significant hazards have been presented to SCRG for acceptance for Interim SGAR 6.
Safety Plan	16/05/2019	Accepted – overview accepted for Interim SGAR 6.
Plan for Monitoring Operations	16/05/2019	Accepted – overview accepted for Interim SGAR 6.
Removal of TJR at J6, J8/9 and J11	23/05/2019	Accepted. Removal of TJR J6, 8/9 & 11 - HA514451-CHHJ-HGN-SZ_ZZZZZZZZZ_Z-TN-OP-0001.pdf CCTV provision reducing from 139 to 113, with 62 mounted on gantries - HA514451-CHHJ-HGN-SZ_TN000000_Z-RP-ZZ-0001 Road safety lighting review - HA514451-CHHJ-HLG-SZ_ZZ000000_Z-RP-ZZ-0001
Relocation of 34 CCTV cameras from	May 2019	Accepted.

Title	Date accepted	Status
standalone masts		
60mph through roadworks trial	June 2019	Accepted – SCRG accepted two potential options to a trial (i) contraflow operation; and (ii) dynamic operation with smart traffic management in narrow lanes. The latter has been selected by the scheme for the trial commencing in November 2019.
De-commissioning of Ramp Metering sites at J5 W/B, J6 E/B and J7 E/B	August 2019	Accepted. Reassessment of Ramp Metering – HA514451-CHHJ-HMC-SZ_XXXXXXXX_Z-TN-EC-0001 GG104 for central barrier between J4-4b - HA514451-CHHJ-HAC-VEZ_DS_RRS_CR12-RA-CH-0001.docx

Appendix E – Scheme safety requirements

ID	Requirement	Responsible				Status at SGAR 6
		Highways England	Designer	Maintenance Service Providers	Operator	
Strategic' Safety Requirements						
Situational awareness / creation and maintenance of a 'controlled environment'						
SRS-01	Signal sequencing rules shall facilitate the required signalling outcomes in response to manual or automatic primary signal settings, and be appropriate for the signal / message sign spacing and operating speed. This should include any scheme specific requirements captured in the Combined Operations PCF product.	Y	Y			To be determined following completion of construction.
SRS-02	Variable mandatory speed control shall be present and operational.		Y			This is included in the design and is documented within the combined operations product.
SRS-03	An automatic queue protection system (e.g. MIDAS) to alert both operators and road users of changes in traffic conditions shall be present and operational.		Y			Complete; MIDAS in already installed on the M4 J3-12 SM scheme.
SRS-04	A compliance strategy shall be implemented to support creation and maintenance of a 'controlled' environment.		Y		Y	This is documented within the scheme combined operations product.
SRS-05	A monitoring strategy shall be in place to facilitate the capture of the required network and safety performance data. This should include any scheme specific requirements captured in the plan for monitoring operations PCF product.	Y	Y			This is documented within the scheme Plan for Monitoring Operations (PfMO).
SRS-06	Stakeholder engagement shall be designed to facilitate and support effective road user education. This should take into account both national and local/scheme issues. This engagement should be recorded in the Stakeholder Management Plan and Combined Operations PCF Products.	Y	Y			This work is ongoing throughout SGAR 6.
SRS-07	Highways Agency (now Highways England) Digital Enforcement Compliance System (HADECS) cameras		Y	Y		To be determined following completion of construction.

ID	Requirement	Responsible				Status at SGAR 6
		Highways England	Designer	Maintenance Service Providers	Operator	
	should be yellow, or in accordance with Department for Transport (DfT) visibility guidance.					
'Tactical' Safety Requirements						
Maintenance						
SRM-01	All equipment shall be designed to eliminate or minimise the need for maintenance and reduce the exposure for road workers ALARP; including <ul style="list-style-type: none"> The provision of a rigid concrete barrier where applicable Roadside equipment requiring maintenance should, where practicable, be clustered and an appropriate access strategy put in place minimising the need for temporary traffic management (TTM) in live lanes. The hierarchy for access to infrastructure has been implemented so that off network access is preferred followed by MHS, to reduce workers exposure to the carriageway and requirement for TTM 		Y			This is documented within the MRS and undertaken when designing. This forms the basis of the road worker safety objective.
SRM-02	Maintenance contractors shall be trained and competent in the appropriate maintenance procedures. Any new or novel features which justify training shall be identified in the Maintenance and Repair Statement PCF product.			Y		To be determined following completion of construction.
SRM-03	Winter treatment shall include all designated places of relative safety (PRS.)			Y		This is documented in the MRS.
SRM-04	Faults that impact on the safe and efficient operation of the system shall be defined and response / repair times incorporated into relevant contracts in accordance with their impact.	Y	Y			This is documented in the MRS.
SRM-05	Sightlines for infrastructure shall be identified in the PCF Stage 6 MRS and shall include, but not be limited to emergency areas, signals, traffic signs and radar vehicle detectors.		Y			This will be included in the SGAR 6 version of the MRS.

ID	Requirement	Responsible				Status at SGAR 6
		Highways England	Designer	Maintenance Service Providers	Operator	
SRM-06	Sightlines identified in the MRS shall be effectively maintained.			Y		This will be included in the SGAR 6 version of the MRS.
SRM-07	Equipment and associated procedures shall be designed with the aim of fully eliminating the need for any carriageway crossings by road workers.		Y			The scheme is designed to IAN 69/15, which aims to reduce road worker exposure to risk.
SRM-08	Whilst their primary use is providing a place for vehicles to stop in an emergency or breakdown, PRS may be used to provide maintenance access, or to assist with the recovery of vehicles or removal of debris during incident management. The use of emergency areas for maintenance activities shall however be subject to MSP specific risk assessments with consideration to the type of activity, location, access duration, traffic conditions, and alternative options for access and without unduly compromising the operation of this facility for road-users. Clear communication protocols must be agreed with the Regional Operations Centre (ROCROC).			Y		This is documented in the MRS.
SRM-09	VMSL and the appropriate sequence of lane divert arrows shall be displayed when TTM is being set out and removed.			Y	Y	To be determined following completion of construction.
Scheme Operation						
SRO-01	Traffic Officer Work Instructions ROC and on-road shall be reviewed and deemed appropriate for safe operation prior to being applied. The need for scheme specific procedures shall also be identified.				Y	This will be completed during Stage 6.
SRO-02	On-road Traffic Officers and ROC operators shall be trained and competent to work in accordance with the latest National ROC and Traffic Officer Work Instructions for smart motorways.				Y	Training will be required for traffic officers and ROC operators, which will be undertaken at the EROC.
SRO-03	Traffic officers and ROC Operators shall be trained in any scheme specific procedures. They shall also be competent in carrying out the tasks and activities defined in the Work Instructions.				Y	Training will be required for traffic officers and ROC operators, which will be undertaken at the EROC.

ID	Requirement	Responsible				Status at SGAR 6
		Highways England	Designer	Maintenance Service Providers	Operator	
SRO-04	ROC operators shall have instantaneous access to the current procedures and guidance at all relevant workstations				Y	To be determined following completion of construction.
SRO-05	The ROC interfaces with Emergency Services shall be effective and shall allow emergency services to carry out their functions safely. This interface should include but not be limited to procedures for accessing incidents, routing of vehicles and communication protocols.				Y	This is detailed within the Combined Operations product and covered by the stakeholder workstream.
SRO-06	The ROC interfaces with Recovery Operators shall be effective and shall allow Recovery Operators to carry out their functions safely. Contact should be made with Recovery Operators at regional level to ensure the implications of ALR are clear.				Y	To be determined following completion of construction.
SRO-07	Traffic Officer Work Instructions shall use a consistent lane referencing system across a scheme.				Y	Complete; Traffic Officer work instructions use a consistent lane referencing system.
SRO-08	A system shall be established to operationally manage the access and actions of maintenance personnel.			Y	Y	This is documented in the MRS.
SRO-09	Joint desk-based training exercises with the Traffic Officers and the Emergency Services should take place before any ALR link becomes operational. These sessions should also include stakeholder staff (Highways England, Maintenance Service Providers, Core Responders or both) with experience of an operational ALR scheme.				Y	This will be organised shortly before scheme opening.
Technology						
SRT-01	Software/hardware shall be in accordance with Highways England type approval and requirements and advice documents. Software development procedures and testing shall be in accordance with Highways England requirements and advice documents.		Y			This is confirmed at Factory Accepted Tests and Site Acceptance Tests.
SRT-02	All site data, system data and firmware shall be maintained under strict version control.		Y	Y	Y	This is completed by the site data team.

ID	Requirement	Responsible				Status at SGAR 6
		Highways England	Designer	Maintenance Service Providers	Operator	
SRT-03	After maintenance activity has been carried out on the technology system and / or equipment, tests shall be carried out to re-commission them to the 'as-built' / as-commissioned state.			Y		This is part of the maintenance procedures.
SRT-04	Pan Tilt Zoom (PTZ) CCTV cameras deployed for ALR schemes shall provide full operational coverage of the mainline carriageway running lanes, including PRS, with no blind spots.		Y			This is included in the design.
SRT-05	The scheme shall build in the ability to remotely diagnose faults and reset equipment remotely by including Internet Protocol (IP) based equipment where possible.		Y			This is included in the design.
SRT-06	A means of displaying Traffic Signs Manual (TSM) Chapter 8 signs using signaling for roadworks		Y			To be determined following completion of construction.
SRT-09	Technology response times shall be amended contractually to be suitable for ALR so that technology outages are limited in number and duration by adherence to the contract requirements.	Y		Y		To be determined following completion of construction.
Infrastructure						
SRI-01	There shall be no signage for pedestrians on marker posts on ALR sections or at points where it may encourage a pedestrian to walk into an ALR section.		Y			This has been incorporated into the design.
SRI-02	The verge should be kept clear of obstructions, where possible. As such lengths of vehicle restraint system (VRS) should be minimised where possible.		Y			This has been incorporated into the design.
SRI-03	The Maintenance Service Provider shall review and where necessary amend and complement existing risk assessments for VRS to determine priority response and necessary control measures to manage risks after any impact damage reported on ALR sections.			Y		To be determined following completion of construction.
SRI-04	A 1.0m verge strip nearest to paved edge of ALR nearside shall be maintained such that the grass length shall be limited to an average not exceeding 350mm, so as to permit emergency public access to the verge.			Y		This will be included in the SGAR 6 version of the MRS.

ID	Requirement	Responsible				Status at SGAR 6
		Highways England	Designer	Maintenance Service Providers	Operator	
SRI-05	The edge of carriageway rib line should have drainage gaps as per Specification for Highway Works (SHW).		Y			Drainage team have confirmed that this has been incorporated into the design.
SRI-07	To dissuade public comfort stops, the ALR verge shall not be hardened where traffic could mount the verge after leaving the hard strip.		Y		Y	This has been incorporated into the design.
SRI-08	Signal locations and possible settings should be such that road users are not forced to make illegal manoeuvres e.g. cross a ghost island.		Y			To be determined following completion of construction.
SRI-09	Construction only – In the event of the gates at Compound 3C being ineffective in preventing access to the motorway due to damage or theft, the Principal Contractor shall treat as a Category 1 safety defect and respond accordingly to prevent public access. The Maintenance Plan should be updated to record the amended priority.			Y		Complete for construction.
SRI-10	Emergency areas shall be provided with orange road surfacing, and advance signing in accordance with MPI 66 Error! Reference source not found..		Y			This has been incorporated into the design.
Lighting						
SRL-01	Where street lighting is removed all edge lines, lane lines and studs shall be replaced.		Y			To be determined following completion of construction.
SRL-02	Where street lighting is removed all new and existing signs shall be assessed for unlit lighting condition and specified accordingly, with reference to The Traffic Signs Regulations and General Directions (TSRGD) and TD25 Inspection and maintenance of traffic signs on motorway and all-purpose trunk roads.		Y			To be determined following completion of construction.

Appendix F - Medium scoring hazards

The table below contains the medium scoring hazards (E07.5 / S07.5 and E07 / S07). The hazards scoring E07/S07 and above represent 99% of the existing scheme risk. When reviewing table H-1 the following points should be considered:

1. N/A = not applicable is for when a hazard only applies 'after' implementation of smart motorway.
2. Post implementation risk scores: '0.0' means no change in risk (highlighted in yellow).
3. Decreases in hazard risk score are highlighted in green (-)
4. Increases in hazard risk score are highlighted in red (+).
5. 'Eliminated' means that the risk has been eliminated.
6. The hazard ID reflects the ALR hazard ID (generic and for M4 J3 – 12 SM scheme). Where applicable the hazard ID in brackets reflects the numbering that was previously adopted for hard shoulder running (HSR) schemes.

Table H-0-1: Medium scoring hazards

Hazard		Baseline risk score	After risk score	Change with ALR
ID	Description			
H2	Abnormal loads – notifiable	7.0	6.8	- 0.2
H32	Health deterioration of vehicle occupant	7.0	7.0	0
H36	Incidents or congestion caused in other lanes or carriageway due to rubber necking	7.0	6.9	- 0.1
H42	Lane(s) closed, but driver unable to leave lane and stops	7.0	7.0	0
H48	Legal-illegal pedestrian(s) in path of vehicles in EA	7.0	7.0	0
H58	Motorcyclist cross wind buffering	7.0	7.0	0
H68	Pedestrian on slip road	7.0	7.0	0
H77	Reduced visibility due to weather conditions	7.0	6.8	- 0.2
H79	Roadworks – long term static	7.5	7.5	0
H80	Roadworks – short term static	7.0	7.1	+ 0.1
H82	Short duration stops / debris removal by TO/Maintenance workers	7.0		Eliminated
H94	TO arrives, but has difficulty containing the scene	7.0	6.9	- 0.1
H99	Traffic Officers/emergency services not despatched in a timely manner	7.0	6.8	- 0.2

Hazard		Baseline risk score	After risk score	Change with ALR
ID	Description			
H102	Undertaking	7.0	6.8	- 0.2
H104	Unsafe lane changing in the slip road (both off and on slips)	7.0	7.0	0
H110	Vehicle drifts out of lane	7.5	7.5	0
H116	Vehicle misjudges entry to EA	7.0	7.0	0
H118	Vehicle on the main carriageway decelerates suddenly	7.0	6.7	- 0.3
H122	Vehicle reversing back to exit slip	7.0	7.2	+ 0.2
H123	Vehicle reversing up entry slip	7.0	6.9	- 0.1
H126	Vehicle stopped on slip road (off or on slip)	7.0	7.1	+ 0.1
H131	Vehicle suddenly decelerates at end of on slip road	7.0	7.0	0
H141	HGV-LGV-Bus exits EA	7.5	7.5	0
H147	Pedestrians walking in lane 1 (applies to ALR only)	7.0	7.0	0
H148	Roadworks – short term static on hard shoulder	7.5		Eliminated
H150	Vehicle in EA (or verge) obtrudes into lane 1 (applies to ALR only)	7.0	7.0	0
H152	Vehicle recovered from EA	N/A	7.0	+ 7.0
H153	Vehicle reversing up hard shoulder (D3M) or lane 1 (ALR)	7.0	5.5	-1.5
H155	Vehicle stops in running lane – peak	7.0	7.5	+ 0.5

Appendix G - Specific population hazards

The M4 J3 to 12 SM scheme hazard log tool assesses the risk for road workers (maintenance workers and traffic officers)

When reviewing the following tables for specific users the following points should be considered:

1. '0.0' means no change in risk score (highlighted in yellow)
2. Decreases in hazard risk score are highlighted in green (-)
3. Increases in hazard risk score are highlighted in red (+).

The highest scoring hazards have been listed (E06 and above).

Traffic officers

Table I-0-1: Most significant and relevant hazards that apply to traffic officers

Hazard		M4 J3 to J12		
ID	Description	Baseline score	Change	Reason for change
H95	Traffic officer in running lane	E6.5	- 0.4	More robust and more frequent signalling to protect traffic officers. Debris to be removed under rolling block, or if significant, a lane closure.
H11	Driver ignores closed lane(s) signals that are protecting an incident	E08.0	0.0	More robust and more frequent signalling - controlled environment perception for motorists.
H82	Short duration stops / debris removal by traffic officers / maintenance workers	S07.0	Eliminated	This activity is eliminated as it can only now happen with a rolling road-block. The risk assessment for the hazard concerning rolling road blocks has been reviewed and adjusted accordingly.
H94	Traffic officer arrives, but has difficulty containing the scene	E07.0	-0.1	Mandatory signals and MS4s with pictograms can be used to protect traffic officers.
H96	Traffic officers behave hazardously at an incident	E06.5	0.0	Implementation of scheme is not expected to impact on this hazard.

Hazard		M4 J3 to J12		
ID	Description	Baseline score	Change	Reason for change
H34	Incident management - rolling block	E6.0	+0.5	Expected to be required more frequently (e.g. to remove debris) because hard shoulder is no longer available with the implementation of ALR
H22	Emergency staff -traffic officer etc on foot at scene of an incident	S6.0	0.0	Expect more live lane breakdowns. Better protection of each incident
H101	Unable to set signs and signals to protect incidents	S06.0	0.0	ORR do not rely wholly on signs and signals for protection
H83	Signals change while traffic officers/ emergency services are still on motorway	E06.0	-0.1	CCTV available for operators to check whether there is still attendance at incident

The highest scoring on road resources (traffic officer) hazards reduce in risk or are eliminated. The risk from conducting rolling road blocks (H34) is expected to increase as more work is expected to be carried out using a rolling road block.

Maintenance workers

Table 0-2: Most significant and relevant hazards that apply to maintenance workers

Hazard		M4 J3 to J12		
ID	Description	Baseline score	Change	Reason for change
H52	Maintenance workers setting up and taking down work site	S07.9	0	Increase in amount of technology and removal of hard shoulder is compensated by the benefit of signalling protecting workers setting out traffic management, and new techniques for maintenance such as remote fault interrogation, fixed tapers and signalling for roadworks. Overall risk expected to remain the same.
H79	Roadworks - long term static	S07.5	0.0	The management of long term static roadworks is not expected to change significantly.
H148	Roadworks - short term static on hard shoulder	S07.5	Eliminated	This would only be possible intra-junction on junctions where TJR is not being implemented. In practice roadworks would not start from such positions.
H82	Short duration stops / debris removal by TO / maintenance workers	S07.0	Eliminated	This activity is eliminated as it can only now happen with a rolling road-block. The risk assessment for the hazard concerning rolling road blocks has been reviewed and adjusted accordingly.
H80	Roadworks - short term static	S07.0	+ 0.1	More equipment needs to be maintained (e.g. signals, MS4s). The controlled environment and the ability to use signals and signs makes work safer (this is being developed for HSR and Controlled Motorways. Some activities that happen under H148 would now happen under this hazard hence the increase in risk.
H136	Collision with workers doing maintenance on verge	S06.5	Eliminated	This activity will not be permitted without TM

The highest scoring maintenance worker hazards reduce in risk or are eliminated. The risk of hazard 'H80 Roadworks - short term static' is expected to increase as more equipment needs to be maintained. In addition work that was previously carried out on/from the hard shoulder and was therefore covered by hazard 'H148 Roadworks - short term static on hard shoulder' is now covered under H80.

Appendix H – Safety risk assessments for the M4 J3-12 SM scheme

There are a number of safety risk assessments that are no longer required, which have been removed from the table.

Name	File Name	Date	Status
HA514451-C2H-M4X-XXX-AS-HW-000259	GD04 Temporary Road Lighting Assessment	Nov-16	Final
HA514451-CHHJ-HAC-S2_DS_SIG_E26-RA-CH-0001	GD04 SIG_E26 non-standard combination of 1 mile ADS gantry (G4-07) and 1/3 mile gantry (G4-04)	Aug-17	Departure approved on 27/02/20
HA514451-CHHJ-HAC-S1_DS_GEO_E47-RA-CH-0001	GEO-E47 GD04 Report Compound Departure for J10 EB Merge 1 Layout	Aug-17	Final
HA514451-CHHJ-HAC-S2_DS_GEO_E32-RA-CH-0001	GEO-E32 GD04 Report Reduced SSD	Aug-17	Departure no longer required
HA514451-CHHJ-HAC-S1_DS_SIG_W15-RA-CH-0001	SIG-W15 GD04 Report Distance of Final ADS from Exit Datum Point for G8-22	Aug-17	Final
HA514451-CHHJ-HAC-S1_DS_SIG_W17-RA-CH-0001	SIG-W17 GD04 Report Final ADS Downstream of Exit Datum Point	Aug-17	Final
HA514451-CHHJ-HAC-S1_DS_GEO_E46-RA-CH-0001	GEO-E46 GD04 Report Compound Departure for J10 EB Diverge	Aug-17	Final
HA514451-CHHJ-HAC-S1_DS_GEO_E48-RA-CH-0001	GEO-E48 GD04 Report Compound Departure for J11 EB Merge Layout	Sep-17	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E82-RA-CH-0001	SIG-E82 GD04 Report Distance of Final DS from Exit Datum Point	Oct-17	Final
HA514451-CHHJ-HAC-SZ_DS_PAV_02-RA-CH-0001	GD04 Report - PAV-02_Unbound Sub-Base	Nov-17	Final
HA514451-CHHJ-HAC-S3_DS_GEO_E09-RA-CH-0001	GD04 Safety Risk Report for Provision of 5 Lane ALR (Eastbound J5-J4b)	Nov-17	Departure approved on 09/12/19
HA514451-CHHJ-HAC-SZ_DS_PAV_04-RA-CH-0001	GD04 Report - Pav-04 Crack treatment using Geosynthetic Asphalt Reinforcement	Nov-17	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E73-RA-CH-0001	SIG-E73 GD04 Report Distance of Secondary ADS from Exit Datum Point	Dec-17	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E80-RA-CH-0001	SIG-E80 GD04 Report Distance of Secondary ADS from Exit Datum Point	Dec-17	Final
HA514451-CHHJ-HAC-SZ_DS_HLG_Z01-RA-EO-0001	GD04 - M4 - use of G3 & G4 luminaires HLG	Dec-17	Final

HA514451-CHHJ-HAC-S2_DS_GEO_E28-RA-CH-0001	GEO-E28 GD04 Report Compound Departure for J6 EB Merge Layout	Dec-17	Final
HA514451-CHHJ-HAC-S1_DS_SIG_W43-RA-CH-0001	GD04 SIG-W43_ Minimum Visibility and tolerance to G7-21	Dec-17	Final
HA514451-CHHJ-HAC-S1_DS_GEO_E9B2-RA-CH-0001	GEO-E9B2 GD04 Report sub-standard spacing of refuge areas (E9-B2 an E8-B3) exceeding 2.5km	Jan-18	Final
HA514451-CHHJ-HAC-S1_DS_GEO_E9A1-RA-CH-0001	GEO-E9A1 GD04 Report sub-standard spacing of refuge areas (E9-A1 and E8-A3) exceeding 2.5km	Jan-18	Final
HA514451-CHHJ-HAC-S1_DS_GEO_W01-RA-CH-0001	GEO-W01 GD04 Report Reduced Carriageway Lane Widths	Jan-18	Final
HA514451-CHHJ-HAC-S1_DS_GEO_W09-RA-CH-0001	GD04 GEO-W09 Compound Departure for J8/9 WB Merge	Jan-18	Final
HA514451-CHHJ-HAC-S1_DS_GEO_E7A4-RA-CH-0001	GEO-E7A4 GD04 Report Reduced Exit SSD	Feb-18	Final
HA514451-CHHJ-HAC-S3_DS_GEO_W36-RA-CH-0001	GEO-W36 GD04 Safety Report on compound departure from standard at J4 WB Diverge	Feb-18	Final
TBC	Places of refuge on exit slip roads	Feb-18	Superseded due to non-TJR decision
HA514451-CHHJ-HAC-S1_DS_SIG_E53-RA-CH-0001	GD04 Report SIG-E53 Visibility to MS4 and out of tolerance	Mar-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR60-RA-CH-0001	GD04 Report GEO-SR60 - Marsh Lane Relaxed vertical curvature on immediate approach to Glebe Close and Oak Stubbs Lane junction	Apr-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR61-RA-CH-0001	GD04 risk assessment for GEO-SR61 reduced SSD and vertical curvature on Marsh Lane on immediate approach to field access at CH.585	Apr-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR62-RA-CH-0001	GD04 Report Marsh Lane Relaxed SSD combined with relaxed vertical allignment (NB&SB).docx	Apr-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR12-RA-CH-0001	GD04 Report GEO-SR12 - Marsh Lane Relaxed SSD on immediate approach to Glebe Close junction	Apr-18	Final
TBC	DRAFT GD04 M4 J3-12 Places of refuge on off-slips v13.docx	Apr-18	Superseded following non- TJR decision
HA514451-CHHJ-HAC-S1_DS_SIG_W48-RA-CH-0001	SIG_W48 GD04 non-standard visibility requirements for gantry G8-08	Apr-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_W51-RA-CH-0001	SIG_W51 GD04 non-standard visibility requirements for gantry G8-16	Apr-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR10-RA-CH-0001	GD04 Risk Assessment_GEO_SR10 Single carriageway (Marsh Lane) with non-standard cross section under TD 27/05	Apr-18	Final

HA514451-CHHJ-HAC-SR_DS_GEO_SR81-RA-CH-0001	GEO_SR81 GD04 reduced junction visibility at minor road (Glebe Close)	Apr-18	Final
HA514451-CHHJ-HAC-S1_DS_GEO_E57-RA-CH-0001	GD04/12 Risk assessment GEO_E57 at M4 J11 eastbound merge	May-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E76-RA-CH-0001	SIG-E76 GD04 Report Distance of Final ADS from Exit Datum Point	May-18	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HAC-S1_DS_SIG_W02-RA-CH-0001	SIG-W02 GD04 Report Distance of Gateway Gantry from Entry Datum Point	May-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E63-RA-CH-0001	SIG-E63 GD04 Report Non-standard Control Signals Spacing	May-18	Final
TBC	DRAFT GD04 M4 J3-12 Places of refuge on off-slips v13.pdf	May-18	Superseded following non-TJR decision
HA514451-CHHJ-HAC-S1_DS_SIG_W45-RA-CH-0001	SIG-W45 GD04 Report Distance of Primary ADS from Exit Datum Point	May-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_W24-RA-CH-0001	SIG-W24 GD04 Report Distance of Gateway Gantry from Entry Datum Point	Jun-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR52-RA-CH-0001	GD04 Risk Assessment_GEO_SR52 Lake End Road - reduced SSD on immediate approach to provide access	Jun-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR16-RA-CH-0001	GD04 Risk Assessment GEO_SR16 Lake End Road - reduced visibility at minor road (Huntercombe Lane)	Jun-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR15-RA-CH-0001	GD04 Risk Assessment GEO_SR15 Lake End Road - reduced SSD on immediate approach to the Huntercombe Lane, J2	Jun-18	Final
HA514451-CHHJ-HAC-SR_DS_GEO_SR14-RA-CH-0001	GD04 Risk Assessment_GEO_SR14 Lake End Road - single carriageway with non-standard cross section	Jun-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E52-RA-CH-0001	SIG-E52 GD04 Report Non-standard Visibility and Visibility Gap to Gateway Gantry	Jun-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_W52-RA-CH-0001	SIG-W52 GD04 Report Distance of Secondary ADS from Exit Datum Point	Jun-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E30-RA-CH-0001	SIG-E30 GD04 Report Distance of Gateway Gantry from Entry Datum Point	Jun-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_E35-RA-CH-0001	SIG-E35 GD04 Report Non-standard Control Signals Spacing	Jun-18	Final
HA514451-CHHJ-HAC-S2_DS_GEO_E37-RA-CH-0001	GD04/12 Hazard Identification & Risk Assessment reduced SSD	Jul-18	Final
HA514451-CHHJ-HAC-S2_DS_GEO_W03-RA-CH-0001	GD04/12 M4 J6 Westbound Diverge	Jul-18	Final

HA514451-CHHJ-HAC-S3_DS_SIG_W65-RA-CH-0001	SIG-W65 GD04 Report Non-standard location for Gantry G2-02	Jul-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E119-RA-CH-0001	SIG-E119 GD04 Report Distance of Secondary ADS from Exit Datum Point	Jul-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_W85-RA-CH-0001	SIG-W85 GD04 Report Distance of Secondary ADS from Exit Datum Point	Jul-18	Final
HA514451-CHHJ-HAC-S3_DS_GEO_W38-RA-CH-0001	GD04 Safety risk report for provision of 5-lane ALR	Jul-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_E39-RA-CH-0001	GD04 SIG_E39 non-standard location of Gateway Gantry G6-18	Aug-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_W60-RA-CH-0001	SIG-W60 GD04 Report Distance of Final DS from Exit Datum Point	Aug-18	Final
HA514451-CHHJ-HAC-S3_DS_GEO_W50-RA-CH-0001	GEO-W50 GD04 Risk Assessment compound departure from standard at M4 J3 WB merge	Aug-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_E44-RA-CH-0001	SIG-E44 GD04 non-standard location of the co-located Gateway Gantry and 2/3 Primary ADS sign on gantry G5-08	Aug-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_E38-RA-CH-0001	GD04 SIG-E38 non-standard distance of primary 2/3 mile ADS gantry G5-08 relative to J6 exit datum point	Aug-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_W39-RA-CH-0001	GD04 Risk Assessment non-standard location of the secondary ADS G3-08	Sep-18	Departure approved with comments. SES comments closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HAC-SZ_DS_PAV_05-RA-CH-0001	GD04 Report - PAV05 - reduction in width of minimum step between pavement construction layers to 150mm for central reserve widening	Oct-18	Final
HA514451-CHHJ-HAC-SZ_DS_PAV_06-RA-CH-0001	GD04 Report - PAV06 - longitudinal binder and base joints to be located in wheel track zone for widening in the central reservation	Oct-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_E34-RA-CH-0001	GD04 SIG_E34 substandard visibility to MS4	Oct-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_W27-RA-CH-0001	GD04 SIG_W27 non-standard distance for Primary 2/3 mile ADS G4-11	Oct-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E87-RA-CH-0001	GD04/12_SIG_E87 non-standard location of the final direction sign G2-04	Oct-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E84-RA-CH-0001	SIG-E84 GD04 Report Distance of Primary ADS from Exit Datum Point	Oct-18	Final
HA514451-CHHJ-HAC-S2_DS_GEO_W22-RA-CH-0001	GD04 Risk Assessment departure for reduced SSD	Oct-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E117-RA-CH-0001	SIG-E117 GD04 Report Distance of Primary ADS G2 14 from exit datum	Oct-18	Final

HA514451-CHHJ-HAC-S3_DS_SIG_E115-RA-CH-0001	SIG-E115 GD04 Distance of Primary ADS G3-11 from Exit Datum	Nov-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E114-RA-CH-0001	SIG-E114 GD04 Distance of Gateway Gantry G3-11 from Entry Datum	Nov-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_W32-RA-CH-0001	GD04 Risk Assessment for non-standard location of gateway gantry G5-03	Nov-18	Final
HA514451-CHHJ-HAC-S2_DS_SIG_W64-RA-CH-0001	GD04 Risk Assessment for non-standard location of secondary ADS on gantry G6-16a	Nov-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_W40-RA-CH-0001	SIG-W40 GD04 Report Minimum Visibility to Gateway Gantry G7-04	Nov-18	Final
HA514451-CHHJ-HAC-SZ_DS_PAV_07-RA-CH-0001	GD04 PAV-07 - concrete base overlaid with 100mm asphalt surfacing for widening in central reserve where widening is less than 575mm	Nov-18	Final
HA514451-CHHJ-HAC-S2_DS_GEO_E63-RA-CH-0001	GD04 Risk Assessment Substandard distance between tip of existing J7 eastbound merge nose and the tip of the existing J6 eastbound diverge nose	Nov-18	Final
HA514451-CHHJ-HAC-S2_DS_GEO_E38-RA-CH-0001	GD04 Report GEO E38 Reduced SSD in Lane 4	Nov-18	Final
HA514451-CHHJ-HAC-S1_DS_SIG_E59-RA-CH-0001	SIG-E59 GD04 Report Non-standard Visibility, Non-Visibility Gap and Control Signals Spacing	Dec-18	Final
HA514451-CHHJ-HAC-S3_DS_GEO_E09-RA-CH-0001	GD04 Safety Risk Report for Provision of 5 Lane Motorway	Dec-18	Departure approved on 09/12/19
HA514451-CHHJ-HAC-S2_DS_GEO_W05-RA-CH-0001	GD04/12 Safety Risk Report for M4 J7 Westbound Diverge Reduced Nose Length	Dec-18	Final
HA514451-CHHJ-HAC-S2_DS_GEO_E66-RA-CH-0001	GEO-E66 GD04 Non standard lane widths	Dec-18	Departure approved on 17/02/20
HA514451-CHHJ-HAC-SR_DS_GEO_SR18-RA-CH-0001	GD04 - SR18 Risk Assessment reduced horizontal alignment and super elevation under TD9/93	Dec-18	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HAC-SR_DS_GEO_SR17-RA-CH-0001	GD04 - SR17 Risk Assessment single carriageway (Wood Lane) with non-standard cross section under TD27/05	Dec-18	Departure and SRA approved
HA514451-CHHJ-HAC-S2_DS_GEO_E30-RA-CH-0001	GD04/12 Report M4 J7 Eastbound Diverge - Substandard Horizontal Radius	Dec-18	Final
HA514451-CHHJ-HAC-S3_DS_SIG_W63-RA-CH-0001	SIG-W63 GD04 Report Distance of Secondary ADS from Exit Datum Point	Dec-18	Departure approved on 14/10/19
HA514451-CHHJ-HAC-S3_DS_GEO_C01-RA-CH-0001	GD04 Report Reduced setback to CSB	Dec-18	Final

HA514451-CHHJ-HAC-S2_DS_GEO_W61-RA-CH-0001	GEO_W61 GD04 Risk Assessment departure for reduced SSD	Dec-18	Departure and SRA approved
HA514451-CHHJ-HAC-S2_DS_GEO_W63-RA-CH-0001	GD04/12 Risk Assessment departure for reduced distance between tip of existing J6 westbound merge nose and tip of existing J7 westbound diverge nose	Jan-19	Departure and SRA approved
HA514451-CHHJ-HAC-S1_DS_SIG_E71-RA-CH-0001	SIG-E71 GD04 Report Distance of Gateway Gantry from Entry Datum Point	Jan-19	Departure approved with comments. SES comment closed out in a technical note but requires an update for Non-TJR. Non-TJR technical note is currently under internal review
HA514451-CHHJ-HAC-S2_DS_GEO_C10-RA-CH-0001	GEO-C10 GD04 Report Reduced Setback to CSB Eastbound	Jan-19	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES.
HA514451-CHHJ-HAC-S2_DS_GEO_C16-RA-CH-0001	GEO-C16 GD04 Report Reduced Setback to CSB Westbound	Jan-19	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES.
HA514451-CHHJ-HAC-S2_DS_GEO_C18-RA-CH-0001	GEO-C18 GD04 Report Reduced Setback to CSB Westbound	Jan-19	Departure and SRA approved
HA514451-CHHJ-HAC-S2_DS_GEO_E69-RA-CH-0001	GEO-E69 GD04 Report Reduced Lane Widths Eastbound	Jan-19	Departure approved on 24/01/20
HA514451-CHHJ-HAC-S2_DS_GEO_C12-RA-CH-0001	GEO-C12 GD04 Risk Assessment reduced set back of concrete step barrier in central reserve	Jan-19	Departure and SRA approved
HA514451-CHHJ-HAC-S2_DS_GEO_E40-RA-CH-0001	GEO-E40 GD04 Assessment reduced SSD in lane 4	Jan-19	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HAC-S3_DS_GEO_C07-RA-CH-0001	GD04 Report Reduced setback to WCSB	Jan-19	Departure withdrawn
HA514451-CHHJ-HAC-S3_DS_GEO_C06-RA-CH-0001	GD04 Report Reduced setback to WCSB	Jan-19	Departure withdrawn
HA514451-CHHJ-HAC-S2_DS_GEO_W59-RA-CH-0001	GEO-W59 GD04 Risk Assessment departure for reduced SSD	Jan-19	Final
HA514451-CHHJ-HAC-S2_DS_GEO_W62-RA-CH-0001	GEO-W62 GD04 Reduced Lane Widths on Westbound	Jan-19	Departure and SRA approved
HA514451-CHHJ-HAC-S3_DS_RRS_CR11-RA-CH-0001	GD04/12 Safety Risk Report for proposed ROTTM signs within working width of the Concrete Step Barrier (CSB)	Jan-19	Departure and GD04 approved

HA514451-CHHJ-HAC-S2_DS_GEO_W07-RA-CH-0001	GD04/12 Risk Assessment non standard reduced nose length at J7 westbound merge	Jan-19	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HAC-S2_DS_GEO_C14-RA-CH-0001	GD04 Risk Assessment Reduced setback to WCSB	Jan-19	Departure resubmitted following VE changes. Awaiting SES approval
HA514451-CHHJ-HAC-S3_DS_GEO_E1A1-RA-CH-0001	GD04 E1-A1 Non-standard location of ERA	Jan-19	Departure approved on 10/01/20
HA514451-CHHJ-HAC-S3_DS_GEO_E01_RA-CH-0001	GD04 J4B-J4 Eastbound Provision of 5 lanes (GEO-E01)	Jan-19	Final
HA514451-CHHJ-HAC-S2_DS_GEO_W12-RA-CH-0001	GEO-W12 GD04 Assessment reduced SSD	Jan-19	Departure withdrawn
HA514451-CHHJ-HAC-S3_DS_GEO_E2A1-RA-CH-0001	GEO-E2A1 Non-standard location of ERA	Jan-19	Departure approved on 28/01/20
HA514451-CHHJ-HAC-SR_DS_GEO_SR85-RA-CH-0001	GD04 - SR85 Risk Assessment single carriageway (Wood Lane) with the omission of carriageway widening at curve approaching the local access road junction at CH19 - CH20	Jan-19	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HAC-S1_DS_GEO_E64-RA-CH-0001	GEO-E64 GD04 Report Non-standard SSD along J12 eastbound merge	Jan-19	Final
HA514451-CHHJ-HAC-S3_DS_SIG_E90-RA-CH-0001	GD04 Report SIG-E90 Distance of Final DS from Exit Datum Point	Jan-19	Departure and SRA approved
HA514451-CHHJ-HAC-S2_DS_SIG_W29-RA-CH-0001	SIG-W29 GD04 Report Minimum Visibility Distance to G4-15	Jan-19	Departure approved with comments. SES comment closed out in a technical note. Awaiting feedback from SES
HA514451-CHHJ-HMC-SZ_MLZZZZZZZZ_Z-RA-EC-0001	GD04/12 Safety risk report for ROTTMS	Mar-19	Final
HA514451-CHHJ-HGN-SZ_TN000000_Z-RP-ZZ-0001	GD04/12 Safety Risk Report for Relocation of CCTV from masts to Gantries / MS4	May-19	Draft
HA514451-CHHJ-HGN-SZ-ZZZZZZZZ_Z-RP-ZZ-0002	M4 J6, 8/9 and 11 – Non-TJR Safety Risk Assessment, October 2019	Oct-19	Final